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JANUARY 1928—THIRTY-FOURTH YEAR

JAN 4 1928

MACHINERY

THE INDUSTRIAL PRESS Publishers. 140-148 LAFAYETTE ST., NEW YORK

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In the Pennsylvania Sugar Company's shop, Armstrong Tool Holders have been specified equipment for over fifteen years. Strong, efficient, economical—the illustration is a good example of Armstrong durability and service. This Armstrong Tool Holder has been in constant service for three years. It is used on one of the most important operations in the shop and, because it is made like all Armstrong Tools, is good for many more years' profitable use.

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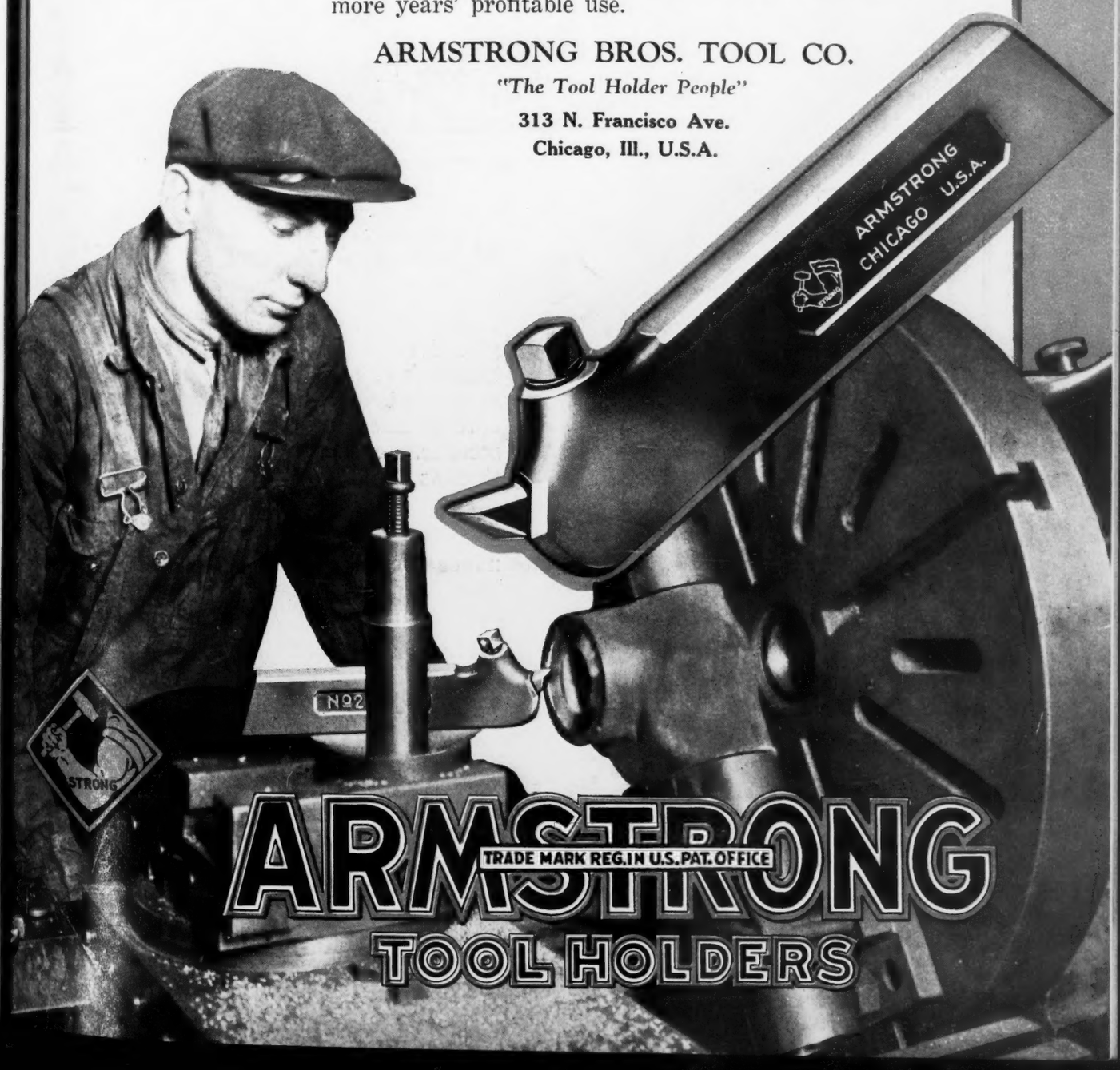

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The better the set screw the more certain your product is to give continuous service. Bristos are the kind of set screws you want for your product, and they cost no more than many other less effective set screws.

Bristos have *great holding capacity*, even under severe strain and vibration.

The quick adjustment feature of Bristo Set Screws gives your product extra selling value. The dovetailed flute socket insures a perfect grip on the screw and immediate response to the wrench.

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The *extra service* in Bristos is the result of the protected socket which does not spread, or split the screw.

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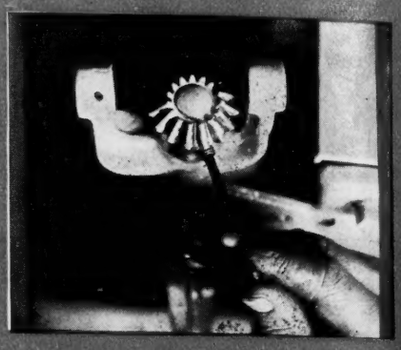
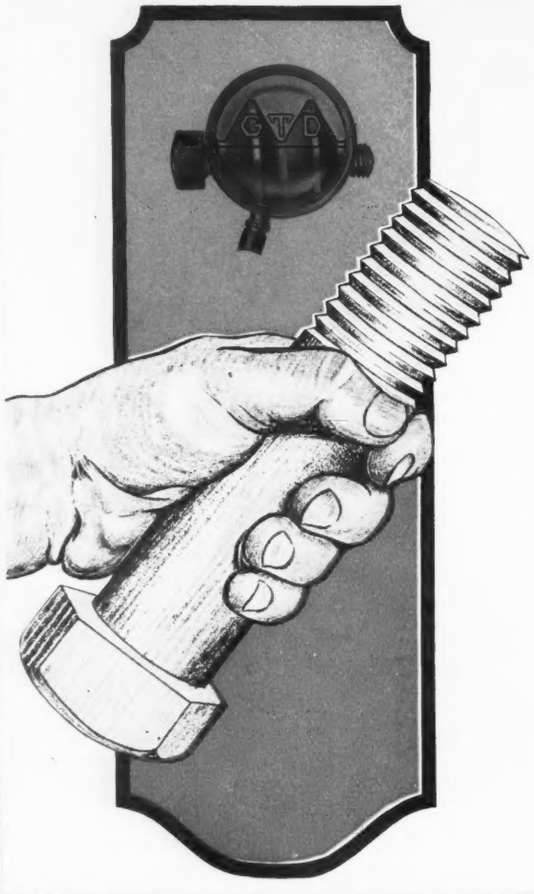


Bulletin 819-E

tells all about the Bristo line, styles of points, how the patented socket works, special screws, accessories and list prices. Write The Bristol Co., Waterbury, Conn., *makers of Bristo socket head cap screws.*

Extra-small sizes — nine diameters smaller than ¼ inch—offer an opportunity to replace slotted head and other less effective types of screws, and to adopt one standard type of screw for all setting work.



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This machine belongs in every maintenance department. It will cut repair threading to one-tenth its cost when done by hand.

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MACHINERY

Opinions of Industrial Leaders

The Prospects for the Coming Year as Seen by Leading Executives in Different Branches of the Machine-building and Metal-working Industries

THE opinions of leaders in the machinery industry furnish a reliable guide in forming an estimate of the business that may be expected during the coming year. These opinions are the basis of the plans made by large manufacturing concerns and should furnish an equally reliable basis for other industrial undertakings. MACHINERY has, therefore, as in past years, obtained first-hand statements from a large number of men prominently identified with different branches of the metal-working industries. In the opinion of these men, 1928 will be a year of comparatively good business. The factors that are particularly encouraging are the absence of large stocks; satisfactory credit conditions; comparatively stable prices; general employment at good wages, assuring strong purchasing power on the part of the industrial population; and satisfactory crop conditions, causing an improvement in the farmer's purchasing power. It is believed that the coming presidential election will not have any important influence on the general industrial activity during 1928.

AIR TRANSPORTATION

By CHARLES L. LAWRANCE
President, Wright Aeronautical Corporation, Paterson, N. J.

The year 1927 has been decidedly unusual. It marks public acceptance of aeronautics as a means of transportation. It is an interesting fact that the wide publicity and public interest given to aeronautics has not come from new principles of design in airplanes, engines, navigation instruments, or piloting, but from the practical demonstration of previously proved principles through the many remarkable trans-oceanic flights.

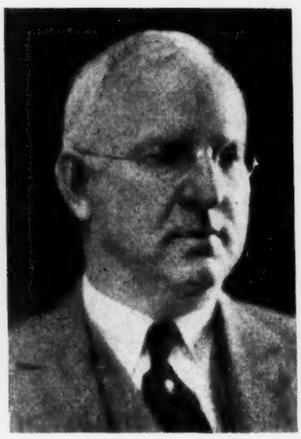
The aviation industry has long prepared for 1927. The airplane today is basically the same as that of the Wright Brothers in 1903. The airplane engine today is but a gradual improvement from that laid down immediately after the war, at which time the air-cooled engine began its period of development in the United States. Navigation instruments show only detailed improvement over those in common use during the past few years. But it took Lindbergh, and his successors, to demonstrate forcibly to the American public the high state of efficiency, reliability, and durability which is now common in American aeronautics.

In exactly the same way, the American mail, express, and passenger transport companies have demonstrated the suitability of American aeronautical equipment for everyday flying, and have proved that aeronautics as a means of transportation can be made profitable. During the past summer the first dividend to stockholders in an air transportation company was paid. The air transportation companies of today are but the forerunners of vast aerial transport systems of the future, carrying mail, express, passengers, and light freight between important centers.

The year 1928 bids fair to carry on this rapid development. The industry itself has prepared for greater production and a continuation of its successful development work.

"It took Lindbergh to demonstrate the high state of efficiency in American aeronautics."—C. L. Lawrance, Pres., Wright Aeronautical Corp'n

"There is no good reason why a presidential year should have any influence on business."—Walter P. Chrysler, Chairman, Chrysler Corp'n



"Studebaker expects great national prosperity in 1928 and is planning its operations accordingly."—A. R. Erskine, President, Studebaker Corp'n

"The present prospects are indicative of an increased production of automobiles next year."—Alvan Macauley, Pres., Packard Motor Car Co.

THE AUTOMOBILE INDUSTRY*

By WALTER P. CHRYSLER
Chairman of the Board, Chrysler Corporation, Detroit, Mich.

There is plenty of evidence that business is fundamentally sound and on a conservative basis. As I write, some business is spotty, but was there ever a time when all business enjoyed good times? Some business is always in trouble, more or less serious. I cannot help feeling that the temporary withdrawal of the Ford Motor Co. from active production has had a retarding influence upon many businesses. I am confident there is an accumulation of orders which, upon the introduction of the Ford car, will greatly stimulate the automobile business.

As business improves in the automobile industry, it will also improve in the steel industry, the railroad industry, and the building industry—all billion dollar industries. The automobile industry is not only the largest of all, based on wholesale value of product, but it is also a tremendous buyer of raw materials.

I do not want to convey the impression that 1927 has not been a good year for the automotive industry. The contrary is true. Taking the average retail deliveries of all makes of automobiles, including Ford, for the first nine months of the last five years, 1923 to 1927, inclusive, as a basis, the deliveries for the first nine months of 1927 have been 93.1 per cent of the average, compared with 113 per cent for 1926; 99.77 per cent for 1925; 90.8 per cent for 1924; and 103.3 per cent for 1923. The retail deliveries of automobiles in the United States during the last five years have fluctuated between 9.2 per cent below average to 13 per cent above average. The relative stability of the automobile industry, as indicated by these figures, will compare favorably with any large industry in the country.

There are some people who view 1928 with uneasiness, because the coming year is to be presidential year. To me this is curious. Well do I appreciate that economic reactions have been experienced during presidential years, but I can find no justification for such changes. There is no good reason why a presidential year should have any influence on business.

Export business in the automobile field is becoming more and more important. We look forward to the time when American companies will be exporting a million cars all over the world.

American business should gain satisfaction out of the fact that it can look back upon a year of good business and can look ahead with confidence. I expect a very good year in 1928.

By A. R. ERSKINE
President, The Studebaker Corporation, South Bend, Ind.

Studebaker expects great national prosperity in 1928 and is planning its operations accordingly. Fundamental conditions in industry and agriculture in the United States and Canada are good. Money and credit are abundant, and foreign countries are constantly increasing their purchases from us. Domestic and export markets are enormous, and American industry, farms, and mines play the major part in supplying them. Why, then, should not this country be prosperous?

The automobile industry expects 1928 to be an excellent year with big scale operations—Ford supplying a substantial part of the total output.

Studebaker's new President Straight Eight models and the new American edition of the Erskine Six now in production, with the Studebaker Commander, which just broke all existing records by traveling 25,000 miles in 22,968 minutes at an average speed of 65.31 miles per hour, and the Studebaker Dictator which also broke the 24-hour stock car class record, form the basis of our expectations for record-breaking results next year.

By ALVAN MACAULEY
President, Packard Motor Car Co., Detroit, Mich.

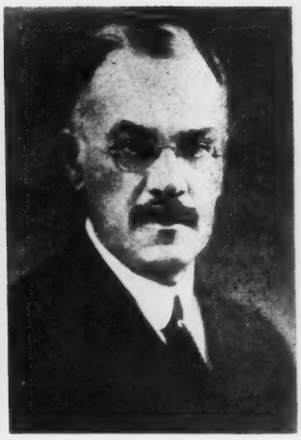
The manufacturing and inspection standards in the automobile industry are as high as, or higher than, they have ever been, and both in materials and workmanship the quality car of today is inherently more expensive than in the earlier days when its price was much higher. The possibilities for improved manufacturing methods have not yet been exhausted. Not only will old equipment be replaced whenever new equipment of a standard or specialized type shows a definite saving in the ultimate manufacturing cost, but entirely new

*An expression of opinion by Alfred P. Sloan, Jr., President, General Motors Corporation, will be found on page 342.

"The fundamental conditions appear sound and our business is showing a healthy growth."—S. Backus, Pres., Burroughs Adding Mach. Co.

"With general business favorable, 1928 will be the biggest year in the die-casting industry."—Charles Pack, Vice-pres., Doehler Die-Casting Co.

"Conditions are sound; demands of 120,000,000 people should provide ample business activity." — Gerard Swope, President, General Electric Co.



"A splendid basic condition is indicated which gives promise of a continuation of prosperity."—E. M. Herr, Pres., Westinghouse Elec. & Mfg. Co.

methods and equipment will constantly be applied where hand-operated processes or machines were formerly used.

The price level for automobiles at the present time appears to be quite stable, and no appreciable reductions in price appear to be contemplated in the near future. The prospects are for an increased total production of automobiles next year. It is likely that the output of all manufacturers, with the exception of Ford, will be about the same as this year, and with Ford included, a material increase in output may be expected.

[A more complete statement by Mr. Macauley, relating to many of the problems in the industry, will be found in the article "Tendencies in the Automobile Industry" on page 347 of this number of MACHINERY.—EDITOR]

BOOKKEEPING, ADDING AND CALCULATING MACHINES*

By STANDISH BACKUS
President, Burroughs Adding Machine Co., Detroit, Mich.

Sales made by the Burroughs Adding Machine Co. are showing a most satisfactory volume in both domestic and foreign markets. From reports for the third quarter of this year, it appears that our volume of sales exceeded that for the corresponding period of 1926. As to forecasting general business conditions for 1928, there is little I can say other than that I see nothing which would indicate the approach of any serious business depression, that fundamental conditions appear sound, that our own business is showing a healthy growth in volume, and that we are looking forward to the immediate future with optimism.

THE DIE-CASTING INDUSTRY

By CHARLES PACK
Vice-president, Doehler Die-Casting Co., Brooklyn, N. Y.

The writer has previously outlined in these columns the fundamental factors upon which the prosperity of the die-casting industry depends. These factors, when reduced to their simplest form, may be expressed in the following proposition: The growth and prosperity of the die-casting industry is inversely proportional to the market prices of zinc and aluminum.

The die-casting industry has been greatly benefited during the past year by the decline in zinc prices, and to a smaller extent, by the slight reduction in aluminum prices. The reduction in costs of these basic commodities has placed the die-casting industry on a more favorable competitive basis and opened up many fields of application for die-castings, heretofore unapproachable, due to the high cost of raw materials. This is particularly true of the zinc-base die-castings. Should the present zinc prices prevail during the coming year, and should the price of aluminum come down to approximately the pre-tariff prices, then we will be able to record an amazing growth of the die-casting industry in 1928.

Favorable market conditions have also acted as a stimulant in developing the engineering phases of the die-casting process. It would not be within the scope of this brief review to detail these developments, but the writer would like to give passing mention to two illustrations of the modern die-casting art that have been placed in commercial use during the past year. The reader is undoubtedly familiar with the R. C. A.'s new 100A loud speaker. The housing of this speaker is made by the die-casting process with a uniform wall stock of 1/10 inch at approximately one half the cost of a similar wood housing. The cowl bars of the Cadillac and LaSalle cars are die-castings approximately 4 feet in length.

The parts mentioned are indicative of the tremendous new fields of application for die-castings. With favorable general business conditions, and there is every indication that these conditions will prevail, the year 1928 will undoubtedly be the biggest year in die-casting history.

THE ELECTRICAL AND POWER PLANT EQUIPMENT INDUSTRY

By GERARD SWOPE
President, General Electric Co., New York

The electrical manufacturing business for 1927 has, on the whole, been satisfactory, and was about the same in volume as for the previous year. The

*An expression of opinion by P. D. Wagoner, President, Elliott-Fisher Co., will be found on page 344.

use of electric current in homes and factories has increased 7 per cent over 1926, and with the exception of 1921, has shown an increase each year since 1919, when the index was first prepared; the consumption in 1927 was more than double what it was in 1919. This is becoming one of the best indices of general and industrial conditions in America.

The outlook for 1928 is, on the whole, favorable. Economic conditions are sound, and the satisfaction of the demands of one hundred twenty million people should provide ample business activity, with the usual attendant improvements in the art. Earnings of labor have never been so high, and with a continuance of good business, their earnings should continue and employment become steadier.

By E. M. HERR, President
Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.

The year 1927 has been a good year for certain industries, but a poor one for others. It has been a fair year in the electrical industry. The use of all kinds of current-consuming devices has grown steadily. With many millions of homes wired for electricity which are as yet inadequately equipped with labor-saving and convenient electrical appliances, there is a continually broadening market for these devices.

During the past year there has been only a fair volume of business in the large generating and control apparatus used in the great public utility stations. This is due to the fact that these stations are now purchasing generating units of such large individual capacity that, when once installed, additional units are not needed for some time.

The application of electric motors to all kinds of industrial needs has shown progress, and has already reached very large proportions. As this use is becoming almost universal, progress in this field should continue at a rapid rate. Motors are more and more being designed to meet special conditions. Because of this, more satisfactory motor applications are being made, which greatly increase the efficiency of the tool or machine to which the motor is applied. Increasing use of electricity for all kinds of industrial heating is indicated.

Progress in the electrification of our railroads has been very much slower than was anticipated some months ago. A considerable increase in the volume of this business in the near future is looked for.

While the fall demand for radio receiving sets was late in starting, radio sales have increased during October and November to such an extent that the volume of business this year bids fair to exceed the 1926 volume.

Although this is a very incomplete review of the electrical industry, a splendid basic condition is indicated, which gives promise not only of a continuation of prosperity, but also of a reasonable increase in the volume of this line of business during the year on which we are about to enter.

By General OTTO H. FALK
President, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Our volume of business in 1927 shows a slight decrease as compared with the preceding year. This does not occur in any special department, but

"We are looking forward to 1928 with a fair degree of confidence. Economic conditions appear to be sound."—General Otto H. Falk, President, Allis-Chalmers Mfg. Co.

"There are many new developments in the electrical tool industry, and we are very optimistic about the future."—S. Duncan Black, President, The Black & Decker Mfg. Co.

is general throughout the various lines of products. We are, however, looking forward to 1928 with a fair degree of confidence. Economic conditions appear to be sound. New uses and applications of electricity are constantly being made. There is every reason to believe that the requirements of public utility corporations will not decrease.

The condition of the financial market offers favorable opportunity for the issuing of new securities and refinancing, which enables corporations to provide the capital for necessary extensions. Stocks of all kinds are comparatively small, due primarily to the fact that excellent railroad service has made possible buying for immediate needs, which should help to produce a steady demand for manufactured goods. The political situation in 1928 may influence business conditions to a slight extent, but it is not believed that it will have an important effect. On the whole, it does not appear that the present slackening in business will be of extended duration, and while its immediate effect will be to reduce output, and in many cases profits, there would seem to be good reason to expect fairly sound and steady business conditions throughout 1928.

ELECTRIC AND PNEUMATIC TOOLS

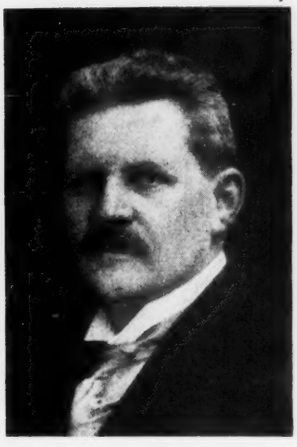
By H. A. JACKSON
President, Chicago Pneumatic Tool Co., New York City

As a pioneer in the development of pneumatic tools, air compressors, and electric tools, this company has watched with keen interest the demand keep pace with industrial growth. Our 1927 business, both domestic and foreign, has been very satisfactory, and our four plants have been working to capacity. A new foundry and a large addition to one of the machine shops are now under construction in anticipation of continued good business. In general, basic conditions in this country are healthy, and our prosperity seems unlikely to be seriously disturbed during 1928.

By S. DUNCAN BLACK
President, The Black & Decker Mfg. Co., Towson, Md.

Our 1927 business ran considerably ahead of 1926. This was made possible by the rapid devel-

"Our expectations for 1928 are very high, and we feel sure our business will continue to increase."—J. A. Smith, President, The United States Electrical Tool Co.



"There is much construction work to be done in this country in the immediate future; this means continued activity."—H. Harnischfeger, Pres., Harnischfeger Corporation

opment of our export business during the year. We expect 1928 to run ahead of 1927 and are making preparations accordingly. There are many new developments going on in the electric tool industry at the present time, and we are very optimistic about the future.

By J. A. SMITH, President
The United States Electrical Tool Co., Cincinnati, Ohio

Our business has been increasing continually since the war, and we have been able to maintain our war peak. While 1927 did not show the increase that we anticipated, it was, nevertheless, a very good year. Our expectations for 1928 are very high, and with the new tools we have to offer, we feel sure our business will continue to increase.

By F. H. ZULAUF
Secretary, The Van Dorn Electric Tool Co., Cleveland, Ohio

The convenience and economy of portable electric tools is being appreciated more and more each year. It is our policy to add new tools from time to time as the need therefor becomes apparent.

Considerable interest has been manifested in high-frequency (180-cycle) drills and grinders during the past year. The year 1927 also witnessed the entry of several new contenders for business in a field where there already existed an excess capacity on the part of experienced and well established producers.

As portable electric tools are used for both production and maintenance, it follows that activity in our industry should parallel the general 1928 curve, and that, individually, business will be good for those properly organized to produce and sell. In this direction we are well prepared.

ELEVATING AND CONVEYING MACHINERY

By H. HARNISCHFEGER
President, Harnischfeger Corporation, Milwaukee, Wis.

I agree with the statements made by many business leaders that nothing is fundamentally wrong with the present economic situation. There is much construction work to be done in this country in the immediate future. More hard-surfaced and wider highways are needed. The disastrous floods of last spring show that much levee work must be done, not only in the Gulf States, but in the entire Mississippi Valley. New building construction seems to be keeping up at a very high rate. All this means continued activity in our line of manufacture, as well as in other related lines.

In our own shop, we expect to carry forward the development work and perfection of our shop facilities which have occupied us in preceding years, and which every progressive manufacturer must do in order to keep up with the times.

We look for satisfactory results in the coming year, and believe that 1928 will be as good as, if not better than 1927, in our domestic as well as in our foreign markets.

By H. L. DONAHOWER
President, Standard Conveyor Co., North St. Paul, Minn.

The Standard Conveyor Co. feels quite well satisfied with the results of its fiscal year 1927. We do business with a great many industries but principally with the metal-working and process industries. These are very large groups. There has, I think, been actually from 10 to 15 per cent less potential business for us to work on in the metal-working industry this past year. Accordingly, in order to maintain our normal volume of sales, it became necessary to exert more strenuous efforts to make better products at more attractive prices, and in general to do everything possible to offset the 10 or 15 per cent shrinkage.

Our statement that there was 10 or 15 per cent less potential business in the metal-working field is borne out by the reports of the iron and steel trade, which indicate that unfilled orders have been less, shipments have been less, and, in general, the consumption of metal has been less during 1927 than during 1926.

This would indicate that potential business in the metal-working field is in direct ratio to the consumption of metal in the same field. Through more strenuous sales effort and improved manufacturing methods, our business in this field has increased rather than decreased in volume. Every wide awake industry, I think, is aware of this condition, and those who have done the most to obtain more business have undoubtedly been successful.

It seems somewhat futile for me to attempt to predict prospects for 1928. I feel that business will go along on a fairly even keel and that there will be plenty of business to be obtained in 1928 by those industries that have made a real effort to meet present-day buying conditions.

ENGINES AND HEAVY MACHINERY

By G. A. RENTSCHLER, President
The Hooven, Owens, Rentschler Co., Hamilton, Ohio

Considering 1926 a "better than average" year, and the fact that our 1927 sales and shipments are in excess of 1926, we are concluding a satisfactory year in our business. Although inquiries have tapered off, we feel that the general outlook for 1928 enables us to anticipate a year equal to, or better than, 1927.

This company has completed three large Diesel engines during the year, and has additional orders

for this type of equipment on its books, with excellent prospects. Sales in power-press machinery have each year shown substantial gains, and we look for a similar gain next year.

At the moment, our manufacturing departments are busy on glass-machinery contracts, which will carry over into next year; and we are negotiating for additional orders covering this type of equipment. The stationary-engine business has been good, with a particularly big demand for large-size gas engines.

Considerable investment has been made to reduce manufacturing costs in both foundry and machine shop operations. This is in line with our past policy of replacing old machines with new and more efficient production tools, and it will be some time before these plans are entirely carried out.

FORGE SHOP EQUIPMENT

By EUGENE C. CLARKE, Vice-president & General Manager Chambersburg Engineering Co., Chambersburg, Pa.

The reduction in automobile production schedules and in railway operating income lessened the demand for forging and pressing machinery during the closing months of 1927. The decreased manufacturing activity has afforded time for the refinement of existing types of forging and pressing equipment, and for the development of new machines to make further labor and material economies.

The year 1928 should produce a wider application of forged parts; there will not only be a displacing of cast ferrous parts, as in the new Ford model, but the forging process will also be applied to non-ferrous metals to secure greater strength, longer life, and less weight—whether used in mechanisms, steam fittings, or for other purposes.

The tendency for forging specifications to more severely govern tolerances, grain flow, etc., will make necessary the replacement of considerable units of smaller equipment by larger, more rigid units, to properly meet competition. The coming year should be one of definite progress in forging and in forging equipment.

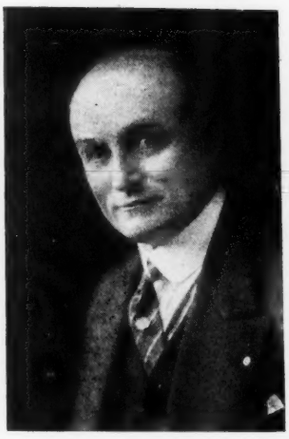
INDUSTRIAL FURNACES

By R. E. TALLEY
President, George J. Hagan Co., Pittsburg, Pa.

Our business in 1927 has been steadier than in 1926, with an increase in volume of somewhat more than 10 per cent. In spite of keen price competition, our margin of profit is better than for several years. This came as the result of recognizing low prices as inevitable and inaugurating manufacturing and sales policies to cope with the situation. During the last quarter of 1927 a general improvement in business conditions prevailed. We expect this improvement to continue well into the new year.

One factor of encouragement in our line is that more and more of the users of industrial furnaces are coming to realize that the manufacturer can sell them furnaces that are better and cheaper than "home-made" equipment. Fifteen to twenty years ago a similar situation prevailed with respect to machine tools. At present, comparatively few concerns make "home-made" machine tools, and the same condition is gradually developing with respect to "home-made" furnaces.

We expect to increase our business in 1928, regardless of the presidential election.



"Competition in 1928 will be as keen as or keener than in 1927; men and tools must be efficient."—E. J. Frost, Pres., Frost Gear & Forge Co.

"Evolution and progress in many fields continue to create new applications for gears of quality."—F. W. Sinram, President, Van Dorn & Dutton Co.

THE GEAR INDUSTRY

By E. J. FROST
President, American Gear Manufacturers' Association, and President, Frost Gear & Forge Co., Jackson, Mich.

Business has been good and gives promise of being better as to volume in 1928 than in 1927. There seems to be a pretty general feeling of confidence and optimism throughout the country, and I think this will be justified, except possibly in some retail lines, where chain and department stores, with their concentrated buying and merchandising methods, will lay obstacles in the path of the smaller units that will prove hard to surmount.

The Chamber of Commerce of the United States has already gone on record as favoring an immediate reduction in federal taxes and a lowering of the rate of the income tax, and these measures, if put through, should act as an extra incentive to business to do its best. The repeal of the war excise tax on automobiles would also undoubtedly stimulate efforts in that line.

It is unfortunate that nearly every year there is a decided let-up in most lines of manufacture near the holiday season, thus depriving workmen of their earnings when most needed. Influential men from all walks of life should give this problem serious consideration, each doing his share to stabilize production schedules, and thus lessen the amount of unemployment.

Undoubtedly, competition will be as keen as or keener than in 1927, thus calling for a repetition of the admonition made a year ago, to see to it that men and equipment be efficient and that obsolescence in machines be carefully watched.

By F. W. SINRAM, Honorary President, American Gear Manufacturers' Association, President, The Van Dorn & Dutton Co., Cleveland, Ohio

The product of the gear industry, reaching into numerous fields, as it does, is a barometer of industry as a whole. Reflecting industry generally,

"It is probable that next year will see a substantial replacement program."—P. E. Bliss, President, National Machine Tool Builders' Association

"It seems likely that 1928 will produce better business than 1927."—E. F. DuBrul, Gen. Manager, National Mach. Tool Builders' Association

present operations are below normal and considerably short of capacity. Prices and business appear to continue on the level of the past several months, with encouraging signs of improvement in some directions. Generally, buyers in both the industrial and automotive fields are not figuring very far ahead. There appears to be a tendency to revert to "hand-to-mouth" buying—a policy that is often not economical.

Evolution and progress in many fields continue to create new applications for gears of quality. A feature of the year just closed is the growing appreciation on the part of progressive machinery and equipment manufacturers of the advantages to be derived from the experience and specialized facilities of the gear specialist. On the other hand, the gear manufacturer who is setting new standards to better satisfy the most discriminating users will find a response that is unknown in times of plenty.

The gear industry, through its organization, the American Gear Manufacturers' Association, is sponsoring research and standardization that is far reaching. Those who contribute most, profit most, provided their activities have been properly directed. The race has always been to the swift. Progress and success will result from readjustments to meet the trend of the times, an abiding faith in America, still the land of opportunity, and confidence in our government.

GLASS-MAKING AND SPECIAL MACHINERY

By W. J. DONKEL, President and General Manager Kent-Owens Machine Co., Toledo, Ohio

The year 1927 will run in total sales volume to about the total volume for 1926. This is for the three major classes of our business, namely, glass-making machinery, special machines of all kinds, and machine tools. While the total volume will equal 1926, the relative alignment by classes of our business has changed somewhat, making special machinery the most important for 1927.

We confidently look forward to a good year in 1928. The glass industry recognizes the need for reducing costs through the use of improved machinery. Likewise, industry in general is turning to new products and drastic cost reduction programs in order to maintain earnings at their former high levels. All these efforts increase interest in special machinery, in the design and manufacture of which we specialize.

THE MACHINE TOOL INDUSTRY

By P. E. BLISS, President, National Machine Tool Builders' Association, and Vice-president, Warner & Swasey Co., Cleveland, Ohio

Better things are probably ahead for the machine tool industry next year. A number of encouraging things are in prospect. The gospel of profitable replacement is steadily making its way with the people who control the purchasing of metal-working machinery. There is growing evidence that the demonstrated good sense of buying the newer, more highly productive machines is increasingly impressive to such people.

Several good authorities state that practically all the new and modern machine tools bought in the last three years are now fully employed, and any increase in manufacturing will have to be taken care of on old and inefficient tools, or new tools of greater productivity must be purchased. It is probable that next year will see a substantial replacement program in the metal-working industries. Fortunately, an increased volume in prospect for most lines of business will accentuate the need for this, and most companies can secure sufficient funds to make these purchases.

The machine tool industry is subject to most of the difficulties that other metal-working industries experienced, and besides, has to deal with a very limited market. In many ways, its problem next year will be that of most other such lines. The better managed companies will have reasonable success; the others will probably do less well than they have in the last two years. Price levels in the industry have not been satisfactory, nor have they reflected the values which the industry has furnished, both in its product and in its service to users. Undoubtedly 1928 will see higher price levels. However, since new metal-working tools are bought only as the need justifies, the increased price level will have little bearing on the number of units purchased.

Volume and profits have been lower in 1927 than most people had anticipated, and surely lower in profits than the industry has needed. A majority of the companies are not making enough money to support them properly and to provide for their extensive and expensive development programs. The users of machine tools have always been the principal beneficiaries of the builders' experimental programs, and it would seem rather short-sighted for these users not to encourage the builders to charge a price that will permit the continuance of this valuable development work. In the very nature of things, they are the chief losers if such programs are not vigorously carried forward.

The industry enters 1928 more fortunate in one respect than many other national industries. While it has made little money in the past year, very few of its companies have any substantial indebtedness. They are for the most part small, self-contained groups that can operate very thriftily, and undoubtedly those that are better controlled will show noticeably improved results next year.

By ERNEST F. DU BRUL
General Manager, National Machine Tool Builders' Association

At the end of last year we were talking of 1926 as a year of "prudent prosperity" for the United States. At the end of 1927 we look back on this year as one of "profitless prosperity" for most concerns. At the beginning of 1927 there were certain factors that were definitely less favorable to business than was the case at the beginning of 1926. As a result, the machine tool industry's orders in 1927 were materially lower than for the previous year.

Just at this time, the same factors seem to promise better results for 1928 than they did for 1927. As a consequence, it seems likely that we shall find that 1928 will produce better business than 1927. The year 1928 seems to be likely to mark the beginning of another business cycle as well as the end of the cycle that began in the middle of 1924.

Most of the increase in business will very likely come to the producers of machines applicable to quantity production, because the mass production idea has grown stronger this year than it was last year. Through the concentration of business that has been going on in large establishments, either by mergers or by taking business away from the small companies, the demand naturally will run to the machines most adapted to quantity production.

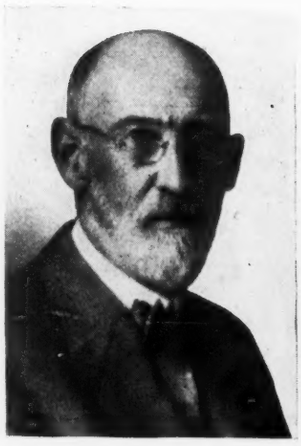
If the builders of quantity production tools get a price in accordance with the utility of their machine to the user, the earnings of the machine tool companies supplying such tools should increase. If the pricing policies of these companies do not take these possibilities into account, the costs of design, special work, special service, etc., will make the profit results less for 1928 than they were in 1927. The builders have the designs; to make a profit on them is purely a question of pricing.

By W. A. VIALL, Vice-president
Brown & Sharpe Mfg. Co., Providence, R. I.

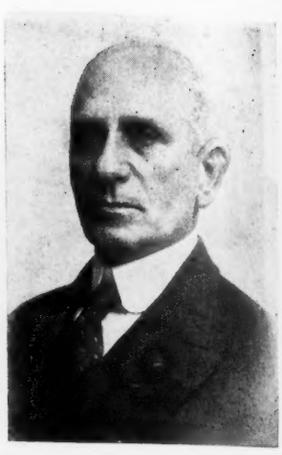
While 1927 opened favorably, the latter part of the year failed, to a disappointing extent, to meet expectations. While not engaged in a seasonable industry, we usually have some falling off in business during July and August; 1927 showed this to a marked degree. This was accounted for in part by the explanation that buyers were holding off for the exhibition at Cleveland. Encouraged with this prospect, many went into the early fall anticipating a real business movement during October and November. Isolated cases proved this surmise correct, but in general it was not. Oftimes buyers like to have an excuse for not buying, and the exhibition was an excuse, much in the same way as taking inventories is in the winter.

Looking forward into the coming year, I fail to see anything that will make for a heavy business. I believe that the machine tool industry as a whole has "struck its stride." There will be a steady demand for standard tools, and there will always be an acute demand for the line of tools that presents extraordinary efficiency.

We are prone to compare our present situation with boom times, rather than with the average and slow periods through which we have passed so many times during the last thirty years. There



"There are many healthful signs looking toward a continuation of good business." —W. A. Viall, Vice-president, Brown & Sharpe Mfg. Co.



"Present-day changes in the materials to be machined call for more rigid, powerful machine tools."—Henry Marx, President, G. A. Gray Co.

are so many signs looking toward a continuation of good business that we have every reason for encouragement upon which to build.

By E. J. FULLAM
Treasurer, Fellows Gear Shaper Co., Springfield, Vt.

Every one has his own method of deciding what he considers a "normal" business year. We feel that the five-year period of 1923 to 1927, inclusive, is a fair basis. If this does not give the desired results, try 1914 to 1927, inclusive. Here you have the war years, the abnormally high years following the war, and the period of depression including the latter part of 1920 and the years 1921 and 1922. Taking either period as a basis, a machine tool business that did not reach "normal" in 1927 is traveling in the wrong direction.

As to 1928 we believe the same conclusion should apply, in that the year before us should bring as large a business as the average of 1923 to 1927, or 1914 to 1927, but not necessarily equal to 1927 alone. Panics are a thing of the past — thanks largely to the Federal Reserve System, but periods of greater or lesser depression can never be escaped entirely. We may expect a mild depression within the next two years, but we believe 1928, as a whole, will be a "normal" year.

In arriving at this conclusion, we are taking into account the natural growth of the country and the rapid development of the transportation system of the whole world. The automobile industry is in its infancy, especially outside this country. The airplane has only recently appeared on the industrial horizon and after that—well that is not a 1928 problem. With all these avenues ahead of him, should the progressive machine tool manufacturer worry about 1928 as compared with a "normal" year? We are optimistic about the industry as a whole.

By HENRY MARX, President
The G. A. Gray Co., Cincinnati, Ohio

As expected, 1927 has been largely a year of buying for replacement rather than for increase of productive capacity. In other words, new tools, at least in the planer field, were installed to replace obsolete and inefficient ones and thus to reduce

Photograph by Bachrach

"While plans for record expansions are not in sight, prospects for replacements are good."—O. B. Iles, Pres., International Machine Tool Co.

"The railroads can show a real saving in labor cost by replacing tools ten to twenty-five years old."—L. S. Horner, Pres., Niles-Bement-Pond Co.

costs, rather than because a great increase of output was demanded. From present indications, it appears likely that this same replacement buying will be the chief source of orders in 1928.

However, another factor besides economy of operation is now increasing the tendency to replace old equipment with new, and that is the trend toward the use of harder and tougher materials. In almost all lines there is an ever-increasing use of steel in place of cast iron, and even of alloy steels instead of the ordinary low-carbon steels. This change in the materials to be machined calls for more rigid, powerful machine tools, and as a result many tools are being relegated to the second-hand market that would otherwise continue on their inefficient way in even the larger manufacturing plants.

It therefore seems to us that the builder of high-grade production tools will have a normal demand for his product in 1928; but the manufacturer whose only sales argument is his low first cost will be hard put to it to find a market in this country.

By O. B. ILES, President
International Machine Tool Co., Indianapolis, Ind.

In regard to our own business, 1927 started like a banner year, but in May, business dropped off and the remainder of the year has been very light. The conditions now are not so good as they were last year, as far as present orders are concerned, but the outlook for the coming year is good, judging from basic business conditions. While plans for a record expansion are not in sight, prospects for replacements are good.

The railroads have, or should have, more machine tool lists this coming year than they had last year. The oil well supply shops should come into the market for more machine tools as soon as the oil business gets back to normal. With other industries that use machine tools in practically the same condition—just waiting for a favorable break to make them busy—we are hopeful that the year 1928 will need more heavy turret lathes than has 1927.

Most machinery manufacturers are using more and more tough alloy steels. For machining these steels, more rugged machine tools are required than was needed a few years back. This is making many machine tools, not built for this severe service, obsolete. This encourages us, with our heavy rugged turret lathes.

By L. S. HORNER
President, Niles-Bement-Pond Co., New York City

General results obtaining in the machine tool and electric overhead traveling crane industries for the year 1927 have been disappointing to many, compared with 1926. However, others believe that in machine tools, 1927 should be put down as a normal year, and our future policy of management guided accordingly. Crane activity is below normal, but will improve in 1928.

There continues in machine tool activities a growing necessity for current facts on production activities, and profits or loss, by separate branches of the industry. Without such facts, neither operating executives nor financial institutions, on which we must depend, can properly frame safe policies. Many feel that there is a growing realization in the minds of the great leaders that closer cooperation, acquaintance, and discontinuance of evident bad business practices are necessary, yes, vital, to improve conditions, and are showing more willingness to give their time and effort to help spread this idea, so that action may be taken, instead of mere approval of an ideal condition.

There is also being made a study of how the great metal-working industries of this country can be informed of the serious necessity for better returns to the machine tool industry, so that research, engineering, and better types of engineering and manufacturing talent can be kept or provided. Entirely new designs and improved designs of existing types of machine tools are a necessity if low labor cost and reduced floor space in our great manufacturing plants are to be maintained.

Well paid technical talent cannot be attracted to the machine tool industry unless it can show greater future possibilities. Such men naturally drift to other activities, where they will be better paid. Serious consideration must be given this problem—the responsibility rests equally on the machine tool industry and its customers.

As regards the prospects for 1928, we feel quite sanguine that it will be better in many respects than 1927. The railroads can show a real saving in their labor cost by replacing tools ten to twenty-five years old by those of modern design. This is being realized, and better railroad business should develop. General manufacturing, and particularly the automobile and electrical plants, will, we believe, enjoy greater activity. The steel industry will share in this activity, and, in turn, will, we feel, buy improved tools to reduce costs.

Consolidation of manufacturing departments and the installation of modern tools is a big part of the answer to the great movement of the New England Council to restore the New England metal-working industry to its former importance. I believe that there are more unprofitable tools in New England than in any other section, no doubt with good reason, because it is there that the oldest metal-working plants are in operation. The signs, therefore, show great promise in 1928 for the basic machine tool industry.

By C. L. ALLEN
President, Norton Co., Worcester, Mass.

In this business review last year, we mentioned that the 1927 volume might not be quite so satisfactory as that of 1926, and it has proved to be even less than anticipated; but, nevertheless, we are not sure but that it might be called, from a conservative standpoint, a normal year. While the total business of the last six months of 1927 will be less than that of the first six months, it is beginning to "come back," and we are looking for a lively business in 1928—at least as large as in 1926.

By E. J. KEARNEY, Secretary and Treasurer
Kearney & Trecker Corporation, Milwaukee, Wis.

The prediction made by me, as published in January, 1927, MACHINERY, that machine tool sales would not fall below those of 1926, has proved itself to be unwarranted optimism. Nevertheless, machine tool sales, as compared with the post-war slump, must be described as very good. The Kearney & Trecker Corporation has concluded a very successful year. If 1928 does not prove to be a better one for the metal trades in general and the machine tool business in particular, the reputation of a great many economists will suffer seriously, because they are all predicting a rise in 1928.

I earnestly hope that conditions will not reach a boom stage, and I do not believe that they will; but I am confidently of the opinion that we can look for better business in our line during 1928.

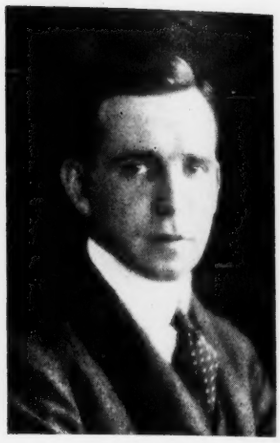
By EDWARD L. RYERSON, JR., Vice-president
Joseph T. Ryerson & Son, Inc., Chicago, Ill.

The machinery trade in 1927 has been affected adversely by several important factors, including especially dull railroad trade, slowness in automotive production, and a serious slump in the oil fields. For our company, the total volume of machine tool sales has been approximately the same as in 1926, but we attribute this to intensified selling effort rather than to a similarity in the market conditions during the two periods.

There appears to be an increasing tendency toward the development of special equipment of various kinds, and much of our activity has been devoted to the sales of such special lines, in keeping with the demands of different classes of industry. It appears likely that this trend toward the development of new types of equipment will continue and that it will be increasingly difficult for the standard machine tool products to retain their position of dominance in the industry.

As for 1928, we foresee no real obstacles in the way of good business. The railroads undoubtedly will contribute a larger share of sales than was secured this year, and there appears to be no grounds for expecting that any sections of the country or any classes of trade will operate on a lower scale than during 1927. The situation demands, on the part of the machine tool builders, foresight as to the necessity for finding new markets and developing new products and courage in asserting the necessity for fairer profit margins than have been secured in recent years in this highly competitive industry.

"I am confidently of the opinion that we can look for better business in our line during 1928 than in 1927."—E. J. Kearney, Secretary and Treas., Kearney & Trecker Corp'n



"The railroads undoubtedly will contribute a larger share of business than they did during the past year."—Edward L. Ryerson, Jr., Vice-pres., Joseph T. Ryerson & Son, Inc.

MATERIAL-HANDLING EQUIPMENT

By JOHN H. BODE
President, The Wellman-Seaver-Morgan Co., Cleveland, Ohio

Manufacturers of heavy material-handling equipment, steel mill machinery, and similar products, witnessed a marked decrease in the volume of business placed during the closing months of 1927. Perhaps the most serious thing with which they have been confronted, however, has been the almost utter disregard which many buyers have had for the rights of manufacturers, who at great expense and in good faith have submitted specially engineered designs of machinery or equipment to accomplish a given purpose, only later to have their designs adopted, but their bids rejected; and such designs, or the special features thereof, so appropriated, have been incorporated in the buyer's new specifications and broadcast to all bidders for new prices. Manufacturers have thus been compelled to compete with their own designs. Manifestly this sort of practice is unfair, is economically unsound, and added to this, the difficulty of excess shop capacity, has resulted in prices that were too low to return a profit. Some remedy for this problem must be found, for if continued, it will result disastrously for all.

Fortunately the industrial situation, having reached the bottom, shows indications of an upward trend. Fundamental conditions are favorable, the replacement of obsolete equipment is receiving attention, and the alert manufacturer will not overlook this field.

We confidently believe that a marked improvement industrially will set in early in 1928, followed by a gradually increasing amount of business, but at a narrow margin of profit, due to severe competition resulting from the excessive shop capacity of so many plants.

THE METAL-CUTTING TOOL INDUSTRY

By JACOB D. COX, JR., President and General Manager
Cleveland Twist Drill Co., Cleveland, Ohio

At the present time people seem to be in a very uncertain frame of mind, and it is difficult to look ahead. For that very reason, probably, business

"The replacement of obsolete equipment is receiving attention. A marked improvement industrially will set in early in 1928."—John H. Bode, Pres., Wellman-Seaver-Morgan Co.

"The jobber is overlooking an opportunity by not carrying sufficient stock to care for his district."—W. T. Read, Vice-president and Treasurer, Morse Twist Drill & Mach. Co.

is somewhat depressed, and is less than it normally should be expected to be. I am inclined to think that after the turn of the year, and when the new Ford car is on the market, there will be a considerable improvement in business, which I expect to see continue throughout the new year.

Money is easy, building construction keeps up remarkably, and building labor efficiency is higher than it has been in a long time, all of which is favorable to a large construction activity. Crops, also, are better than could have been reasonably anticipated some time ago. For all of these reasons I am inclined to believe that business next year will be better than this year.

By W. H. EAGER, President
Whitman Barnes-Detroit Corporation, Detroit, Mich.

We have found the year 1927 to be one of many irregularities. Months that have been traditionally large in volume have this year sometimes been among our smallest months' sales, and vice versa. Hand-to-mouth buying has accounted for an even larger proportion of sales than heretofore. It may have had some influence upon the irregularity of sales; yet, our opinion would be that it should serve to produce a more even average.

Unwise price policies have been a disturbing element at times. For example, we have known of instances where vendors have voluntarily reduced their selling prices in the face of assurance that the business was already in hand. The resulting instability of prices is not desired by the majority of buyers themselves. A keen buyer can do better for his employer when markets are fairly stable than when the situation is otherwise.

Looking ahead for 1928, it appears to us that the first six months' business should be very good. We have no clear opinion about the latter half of the year. It is generally understood that the automotive industry, meaning thereby, the production of automobiles and the businesses of those who contribute directly or indirectly to the production of automobiles, is now our largest industry. Much depends, therefore, upon the situation with the automobile manufacturers. The Ford Motor Co. is unquestionably a large factor in the industry, and it is almost certain that Ford will be going strong during the first six months. Furthermore, it is our opinion at this writing that the business which will go to Ford will be more than what his competitors will lose to him. In other words, it looks as if the total volume of sales of cars for 1928 would be in excess of that for 1927.

Foreign competition is appearing from time to time, and looks as if it might become more of a problem. Taxation is, of course, still with us, and particularly burdensome are local and state taxes. More attention must be paid by business organizations to the local tax situation.

By W. T. READ, Vice-president and Treasurer
Morse Twist Drill & Machine Co., New Bedford, Mass.

General reports on 1927 business show in most instances a decreased volume, as compared with 1926, although certain high spots have prevailed in some lines, and as is usual under such conditions, competition has been keen. No change has been apparent in the method of buying, although it appears to the writer that the jobber or distributor in many cases is overlooking an opportunity by not carrying sufficient stock to care for the immediate district he serves, capitalizing this very hand-to-mouth movement, instead of forcing the consumer to shop around, and then send to the manufacturer.

Profit margins have necessarily been lean, although we believe there is a better understanding generally in all lines for the need of prices commensurate with costs, rather than a blind meeting of any kind of competition. We look for fully as good business conditions during the coming year, and there are some factors which lead us to believe that there may be better volume and conditions.

THE PRINTING PRESS INDUSTRY

By R. V. MITCHELL, President
Harris-Seybold-Potter Co., Cleveland, Ohio

The printing press industry entered 1927 with a normal volume of business which continued through the earlier months. As spring advanced, the publicity attending the preparations for the great event of the year in printing circles, The National Graphic Arts Exposition, which is now held only once in five years, began to attract attention, with the result that there was a distinct falling off in orders for new machinery during the spring and summer.

The printers and lithographers of today are wide awake and progressive, and were evidently desirous of seeing the latest developments in the machinery line before purchasing their 1927 equipment. The exposition held in the Grand Central Palace in New York City in September was very largely attended, and is considered the most successful in the history of the industry. The exhibits of machinery were unusually large and varied.

During and since the exposition, our sales of printing and lithographing presses have shown a remarkable increase, and we are looking forward to excellent business in 1928.

By JOHN F. FALLON, Manager, Kelly Press Division,
American Type Founders Co., Elizabeth, N. J.

The printing machinery business as far as Kelly automatic presses are concerned, fared well during

1927, but was not quite up to the expectation justified by the large demand for presses near the close of 1926. General business conditions are usually reflected in our sales, made through the American Type Founders Co. distributing houses and a number of foreign dealers. The field covered is wide, so that local conditions, if adverse, are absorbed in the general volume.

While we cannot forecast for 1928 with any certainty, we are encouraged by many indications to believe that our sales will be increased by a fair percentage. A new model Kelly automatic press, known as style A, is now on the market and is enjoying a good sale. This press is expected to contribute substantially to our 1928 total.

The printing machinery business is dependent to a large extent on the general prosperity of industry, notwithstanding that the product of presses, wisely distributed, is also the creator of a demand for commodities, and thus contributes to the building up of the business of the country.

There is still in use much old style printing equipment, making it difficult for its users to compete with the more progressive concerns, who have found it advantageous to scrap the unproductive part of their outfits. This trend to rehabilitation means a continued demand for our presses and leads us to look forward with confidence to the future.

ROLLING MILL MACHINERY

By H. F. WAHR
President, Mesta Machine Co., Pittsburg, Pa.

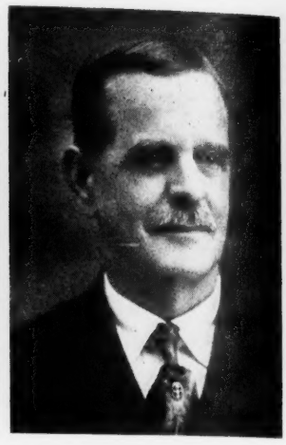
Taking the industry as a whole, the production of rolling mill machinery in 1927 may be considered fairly good, but the amount of such machinery contracted for during that year fell far short of that placed in 1926. The production in 1927 was augmented considerably by uncompleted contracts carried over from the previous year.

While there appears to be considerable business in the making, the amount of new machinery that will be contracted for in 1928 will depend to a great extent upon conditions in the steel industry. If that industry operates on a normal tonnage basis and if the prices of rolled steel products are raised to a reasonable level, the rolling mill machinery builders can expect a fair amount of business. If, however, operations in the steel industry during 1928 are on as low a tonnage basis as during the latter half of 1927, coupled with the same keen competition, there will be little or no surplus for expansion or renewals. In such event, the machinery builders can look forward with no degree of optimism.

Regardless, however, of conditions in the steel industry, there are still quite a number of steel companies operating old and inefficient equipment, and it will be imperative for them to replace such equipment with modern up-to-date machinery in order to keep pace with those companies that have already made such improvements.

Labor forms a considerable part of the cost of rolled-steel products. Therefore, the main object of rolling mill machinery builders today, in designing such machinery, is to reduce labor in the operation of rolling mills. The advent of machined tight-fitting universal couplings between the pinions and rolls, cut tooth gearing entirely enclosed and running in oil, the use of roller bearings where feasible, fast operating manipulators, devices for quick roll changing, substitution of steel and alloy steel castings for iron castings, and other improvements in design and materials have sped up mill production and lowered power consumption, as well as effecting a reduction in labor, maintenance, and replacement cost.

"Old inefficient machine tools, usually costly to keep in repair, must be replaced by modern tools."—H. F. Wahr, Pres., Mesta Machine Co.



"We cannot see that business will be exceptionally good nor exceptionally quiet."—A. F. Cooke, Vice-president and Manager, Fawcus Machine Co

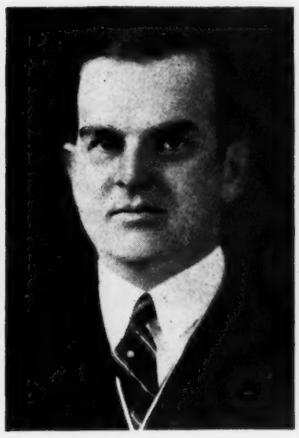
In the construction of rolling mill machinery today, the high quality of materials used and the precision in fits and alignments approach that of the modern machine tool, resulting in much longer life of parts subject to wear and replacement.

To say the least, competition in the rolling mill machinery business during the past year was keen, and in numerous instances might be considered ruinous. Machinery builders, in order to keep pace with such conditions, must also give serious consideration to the question of antiquated machinery in their own plants. Old inefficient machine tools, which are usually costly to keep in repair, must be replaced by modern tools that do more accurate work and have a higher rate of production per man hour.

During the years 1926 and 1927, this company spent $300,000 for new machine tools and the remodeling of old tools in order to increase accuracy and efficiency. Some of the new tools were purchased from machine tool builders, while others were built by the company itself. Among the latter might be mentioned a 100-inch draw-cut shaper, the largest of its kind in existence, which, on the average, effected a saving in time of 50 per cent over that of other tools on similar work. A second machine of this kind is now being built by the company.

Other notable installations of machine tools manufactured by the company were a helical pinion planer which will handle pinions up to 96 inches in diameter by 72-inch face, a gear-hobbing machine which will handle gears up to 17 feet in diameter by 60-inch face, a 60-inch roll lathe and a double-headed heavy-duty shaper for machining roll and pinion wabblers. Numerous improvements also were made throughout the plant on equipment other than machine tools, making a total expendi-

"The prospects for 1928 are good, with indications of increasing activities."—A. S. Rodgers, President, White Sewing Machine Corporation



"The outlook for business in weaving machinery is favorable."—John F. Tinsley, Vice-pres. and Gen. Manager, Crompton & Knowles Loom Works

ture, including new equipment, of over $500,000. This figure is exclusive of any maintenance or ordinary repair expense necessary to keep machine tools and other equipment in a first-class operating condition.

By A. F. COOKE, Vice-president and Manager
Fawcus Machine Co., Pittsburg, Pa.

In reviewing the business of 1927, it is rather astonishing to note how the industrial demand can change drastically in a short time. The first six months were very good, with fair profits; the last six were extremely poor, with no profit at all.

The future is problematical. The financial experts are all predicting good business for 1928. However, none of them have informed us where this business is going to originate. We are manufacturers of heavy gears and gear transmissions, and are specializing in steel mill equipment, and we are unable to see where the good times are coming from. The production of steel is unquestionably in excess of the demand, which means that new equipment for manufacturing will not be purchased. We, of course, are making every effort to extend our lines into other fields, but all fields are well covered and competition necessarily is keen, profits being small or nil.

We cannot, from our viewpoint, see that business in 1928 will be exceptionally good; however, neither do we anticipate an exceptionally poor year. We think that we will have enough business to be able to pay a small dividend.

THE SEWING MACHINE INDUSTRY

By A. S. RODGERS, President
White Sewing Machine Corporation, Cleveland, Ohio

All things considered, the sewing machine industry seems to have made reasonably satisfactory gains during 1927, despite a number of factors that naturally build up resistance; and the White Sewing Machine Corporation, with its subsidiaries, has likewise shown consistent increases (which will probably be the equivalent of a substantial gain over 1926) through its "branch store system" of distribution. In all probability, the industry in general will experience similar results.

The prospects for the coming year are good, with indications all about us of increasing activities along different lines, and with labor employed on a large scale; hence, barring the unlooked for, a reasonable increase should be realized.

The economic value of the sewing machine has been greatly emphasized by the introduction of the electrically driven type which is rapidly replacing the old style treadle model. Another very important factor with our company is the establishment of sewing schools which are being operated at all of our branch stores in the principal cities of the country, where, as a part of our service, we give free to the purchaser of our electrical product a complete course in sewing and dress making. Through this service the purchaser quickly realizes the great economic value of a good electric sewing machine, not only through the understanding of its general mechanical operation, but also by realizing what the sewing machine can be made to do in enlarging the wardrobe, on a very inexpensive basis, of the entire household. This, in turn, stimulates, to a substantial extent, the purchase of raw materials and findings upon the part of the housewife, which has a favorable reaction upon the textile mills and other producers.

THE TEXTILE MACHINERY INDUSTRY

By JOHN F. TINSLEY, Vice-president and General Manager
Crompton & Knowles Loom Works, Worcester, Mass.

In our line—weaving machinery—1927 opened poorly, as compared with the corresponding period in 1926, and continued on a somewhat sub-normal scale for the first half of the year. About the middle of the year an improvement was noted, which increased and continued up to the last quarter, so that at present, our operations are on a scale approximately 20 per cent greater than during the first half of the year.

The cotton goods situation, while improved over that of a few months ago, has not opened up sufficiently to stimulate purchases of machinery in what may be called standard lines, such as duck, gingham, etc. The silk-loom field is unsatisfactory, as is the carpet-loom end of our business. The woolen and worsted business is distinctly better.

In general, however, the outlook for improved business in our line is favorable for the next few months. The second half of 1928, with its presidential election, is uncertain; but I look for a fairly satisfactory volume of business in 1928, and believe the election will have a less depressing effect on business than is usually associated with presidential election years.

VACUUM CLEANERS

By A. M. EVANS
Sales Manager, Federal Electric Co., Chicago, Ill.

The sale of our electric vacuum cleaners during 1927 exceeded the quota which we had set for the year, and we look forward to still greater sales in 1928. With the high wage scale, stabilized or declining commodity prices, easy credit, and favorable employment situation now prevailing throughout the country—which promises to continue—there should be no decrease in business during the early part of 1928.

"Nineteen twenty-eight seems to hold better things in store. It should bring an increased volume over 1927."—Howard Coonley, Pres., Walworth Co.

"The coming year will see improved employment conditions which will stimulate general business."—C. P. Egan, Pres., J. A. Fay & Egan Co.

VALVES AND FITTINGS

By JOHN B. BERRYMAN
First Vice-president, Crane Co., Chicago, Ill.

The year 1927 appears to have ended with a volume of business in our line (valves, fittings, plumbing supplies, etc.) a little less than in 1926, a result which we anticipated. In the South the buying power was lessened by the Mississippi floods and the after effects of the collapse of the real estate speculation in Florida.

There was an over-production of oil, with a corresponding curtailment of buying, and the volume of residential and industrial building was somewhat smaller than in 1926. Profits have been small, but collections are good, and we seem to be on a sound basis.

By HOWARD COONLEY
President, Walworth Co., Boston, Mass.

From many points of view 1927 has been disappointing. The expected volume did not materialize, and the usual fall expansion was not in evidence. At the same time, the year has been productive of much good in view of the fact that it has brought into relief the necessity of economy, efficiency, and good service—with some profit, at least, to show for the effort. The year 1928 seems to hold better things in store. The presidential year bogy has been destroyed. Money is cheap and likely to be cheaper. Stocks are low, the farmers more prosperous, and the great problems of the past year in the oil fields are nearing a solution. The Ford Motor Co.—undoubtedly a tremendous factor in the balance of business—is once more in the market with a product that seems to have met in every way the hopes of Ford friends not only in this country but abroad. Hence, 1928 should bring an increased volume over 1927.

WOODWORKING MACHINERY

By CLIFFORD P. EGAN
President, J. A. Fay & Egan Co., Cincinnati, Ohio

Some months during the fall of 1927 saw unfavorable and spotty business; but, on the whole, the conditions at the end of the year are satisfactory. Competition remains keen, and methods of manufacturing must be improved, not only in our own plant, but in the lumber industry as a whole.

Everyone owes it to their industry to do something to advance its cause. With this in mind, we have developed in the past year improved electrically driven, ball-bearing woodworking machines, which were accepted by the woodworking industry with much favor. This was one of the reasons that the volume of our business was maintained during the past year.

Even though 1928 will be a "presidential" year, we believe that it will see improved employment conditions, which will not only stimulate general business, but the woodworking industry as well.

The foreign trade is beginning to accept our machines with open minds, having noted the success that American lumber manufacturers are having with electrically driven, ball-bearing equipment.

* * *

PROSPECTS IN THE AUTOMOBILE INDUSTRY*

By ALFRED P. SLOAN, Jr.,
President, General Motors Corporation, New York City

The production of the automotive industry, as a whole, during the year just closed, has been substantially below the level of 1926; but this simply reflects the fact that one of the large producers was out of production for a large part of the year. Except in the price field occupied by that producer, buying has been well sustained. The business of the truck industry has been very good. Export volume has greatly exceeded that of any previous year.

I see nothing except soundness in the general economic situation. This, together with the improved position of the agricultural sections of the country, leads me to believe that 1928 will be a good year for general business. With a year of good general business in prospect, I feel that the automotive industry may confidently look forward to a year of large volume. As a matter of fact, I feel quite certain it will be greater than any previous year. As the total number of cars in use grows larger each year, more cars reach the end of their useful life and have to be replaced, so that the industry's business from this source is constantly on the increase. Then, we should remember that there is a large number of additional families each year who find that a second, third, or even fourth, car is required to meet their transportation needs.

I feel that the overseas markets offer wonderful opportunities for increased sales. The American type of car is the most acceptable of all types in most overseas markets. As good roads are developed, as the economic value of the motor car becomes realized, and as American manufacturers are able to intensify their sales effort overseas, I believe it will be a surprise to find what can be accomplished. General Motors is keenly interested in the development of overseas business, both from the standpoint of its own operations, and because of the beneficial influence the development of a large export business has on American prosperity.

*This statement was received too late for publication under the heading "The Automobile Industry" on page 330 of this number of MACHINERY.

TAP DESIGN AND CONSTRUCTION

By A. L. VALENTINE, Works Manager, Tap and Gage Division, S K F Industries, Gothenburg, Sweden

The article on "Tap Design and Construction" by E. J. Bryant, on page 128 of October MACHINERY, calls for the following additional explanation. In the writer's opinion, the tap designed as shown at *C*, Fig. 1, was for many years the best obtainable tool for the purpose for which it is intended, but in this, as in every field, experiments and constant endeavors to make improvements are likely to bring about the development of still better tools. In this connection, it should also be noted that all manufacturers of ground taps have not yet solved the problem of grinding and at the same time relieving such spiral-fluted taps as advocated by the writer in a previous number of MACHINERY; and, of course, the best results can only be obtained by proper grinding and relieving.

However, in considering the problem in hand, let us ignore the advantage of ground taps, as such, and give our attention solely to the oblique position of the cutting edges. We then find that there are certain advantages inherent in the construction of the tap shown at *C*, chief among which is the fact that the chips are forced out of the nut ahead of the tap in a very effective manner. A comparison between the taps shown at *A* and *C*, page 128, October MACHINERY, and a study of the illustrations in Fig. 1 will establish the fact that in this respect the same results are obtained by both types of taps. If there is any difference, it would seem that this would be in favor of tap *A* (page 128, October MACHINERY), because even if most of the chips are forced out of the nut because of the oblique cutting part at the tap point of tap *C*, the chips remaining—and some do remain—when the cutting part has done its work, would not be removed by the aid of the shallow fluted parallel part of the tap, whereas in the case of tap *A*, the conditions would be the reverse. The use of both kinds of taps has established this.

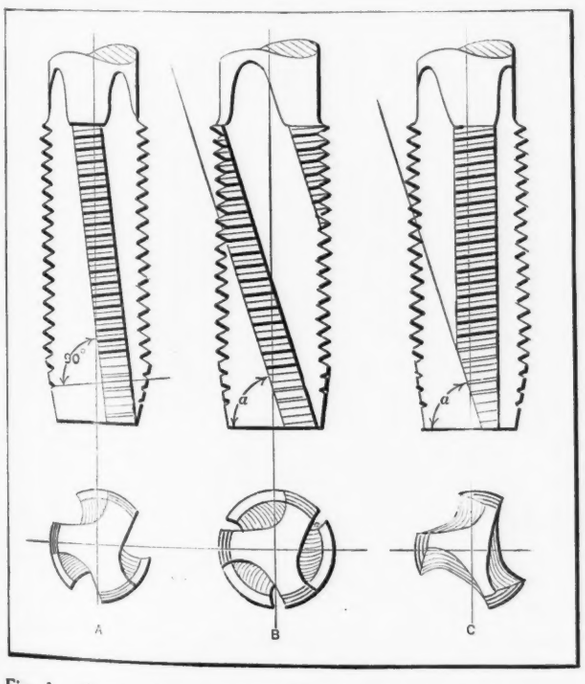


Fig. 1. Comparison between Three Different Tap Designs

Tapping with a tap having straight flutes does not generally give so clean and fine a thread surface to one side of the nut thread as to the other. This may be illustrated graphically by considering the action of a spiral-cut side-milling cutter in milling a slot, as indicated in Fig. 2. This cutter will produce a smoother cut on the right side than on the left. The same is true of the cutting edges of a tap, if the angle is greater or less than 90 degrees relative to the thread helix. Therefore, it appears that the ideal tap is one that feeds the chips forward and at the same time cuts threads that are of the same degree of smoothness on both sides of the nut thread. The design of such a tap should evidently be as shown at *A* in Fig. 1, where the cutting edge of the tap forms an angle of 90 degrees with the thread helix.

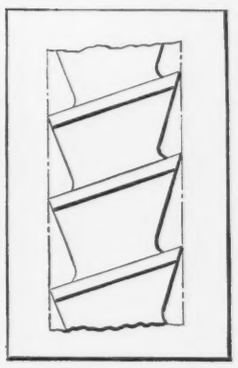


Fig. 2. Action of Cutting Edges of Side Milling Cutter

The capacity of a tap to cut materials that are tough enough to allow the extrusion of the chips in spirals, so that they are not broken off, depends on many factors besides the obliquity of the cutting portion. Any tap designed with the correct flute form and cutting angle, using proper lubricant, and that is kept sharp, will produce spiral chips. Tests made with taps designed as advocated by the writer have proved that they meet the claims made, both as regards chip formation, chip form, removal of chips from the flutes, and power consumption.

It has been stated that spiral-fluted taps cannot produce chips of the form shown on page 128 of October MACHINERY, except in the case of large taps that can be made with steep spiral flutes. The cutting conditions are just the same for large and small taps, so long as the relation between the angle of the cutting edge and the thread helix is maintained, but it will be freely admitted that the advantage of the spiral for small taps, or taps with a small thread helix, is not very great, because, generally, the small depth of thread means that these taps seldom cut sufficiently large chips to permit them to curl or come out in a spiral, even if the material is tough. This is one of the reasons why the writer does not advocate making taps below 1/2 inch with spiral flutes.

Regarding the sharpening of taps, laboratory research has thrown a light on this subject that disproves the general belief that a tap need only be sharpened on the front of the cutting part. This is particularly true in connection with taps used for mass production. A tap wears on the outside of the land, as indicated at *A*, Fig. 3, as well as on the front of the land. The wear on the outside is especially concentrated on that spot on the land where the contact with the nut first takes place, so that on a rather limited area near the tap point it becomes worn to a cylindrical form.

Consequently, in sharpening, the outside of the land should first be ground to such an extent that the indentation referred to wholly disappears. The worn tops of the threads on the chamfered portion are then also partly sharpened. If the flutes are

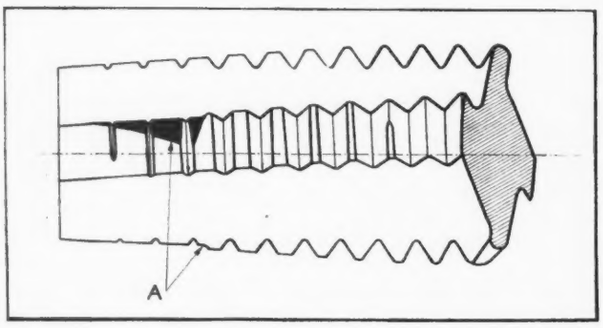


Fig. 3. Wear of Taps

straight, the parallel threads are also subjected to a slight but gradual wear, because, even though the oblique cutting part (as in *C*, Fig. 1) removes the greater part of the chips, the remaining threads in the straight-fluted portion will form some chips, partly due to the pitch error. Therefore, to properly sharpen an ordinary or ground spiral-fluted tap (*A*, Fig. 1), only two operations are necessary—grinding on the outside of the chamfered portion and grinding the front face of the cutting edge. Three operations should be performed in completely sharpening a tap of the construction shown at *C*, Fig. 1—one on the outside of the chamfered portion, one on the front face of the chamfered portion, and one on the straight-fluted portion.

The value of taps made as advocated by the writer is not based upon mere theory, as these taps have been thoroughly tested in extensive laboratory experiments and in shop use, as compared with taps of different designs. After all, it is only by such thorough tests and experiments that the value of one design, as compared with another, can be thoroughly established.

* * *

ACCOUNTING, ADDING AND CALCULATING MACHINES*

By P. D. WAGONER
President, Elliott-Fisher Co., New York City

American business in 1927 is now a matter of history. Despite some spotty conditions that began in the spring, business on the whole was above normal throughout the year. Underlying conditions have appeared and still appear to be sound. The supply of credit remained adequate, and this most helpful factor made it possible for business as a whole to show some slight increase over any preceding similar period. It is my belief that to be successful it will be necessary for business in all lines during 1928 to be most active in selling and economical in operation, and to perform a real service to the buyer.

I believe that business should be operated upon a cautious, conservative, prudent, yet aggressive basis. This is the way our nation's business has been run for several years, and as a result, there has been brought about an unparalleled prosperity for all. What is good for the nation's business is good for the individual business.

The mission of Elliott-Fisher accounting machines and Sundstrand adding and calculating machines is to bring to the business man daily figure facts which will enable him to be cautious, conservative and prudent, yet aggressive. These machines make records and present them when they are most needed—a true motion picture of current as well as of past events, represented by facts and figures, which are the guide posts in the operation of a business. We believe that we know fairly well the trend of the times, because we receive information daily from our factories, supplemented by data from two hundred and fifty distributing centers in the United States, eleven British offices, and approximately one hundred export offices all over the world.

Our business in 1927 was greatly augmented through the purchase of the assets of the Sundstrand Corporation in the latter part of 1926. As a result, we have been encouraged to continue our expansion plans. An association is about to be made of the interests of the Elliott-Fisher Co. with the interests of the Underwood Typewriter Co. The new company, composed of allied, yet non-competitive interests, is to be known as the Underwood Elliott Fisher Co.

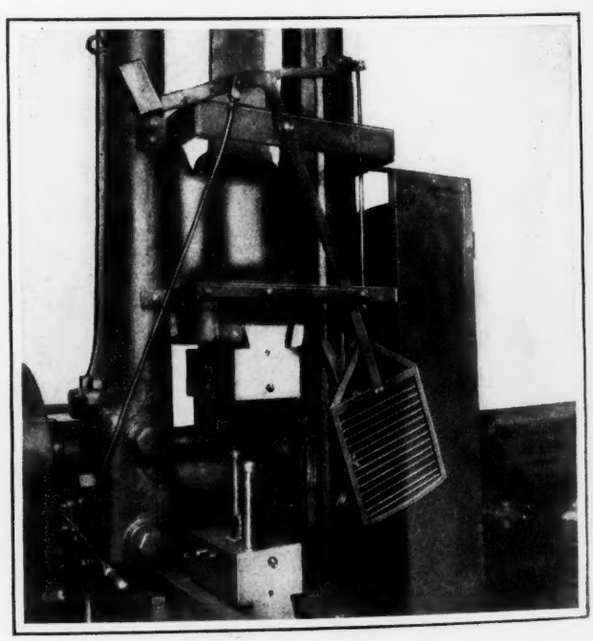
We believe our business should and will keep on growing because our products are business necessities which create records that are timely and make for the betterment of business.

* This statement was received too late to be included under the heading "Bookkeeping, Adding and Calculating Machines" on page 331 of this number of MACHINERY and is, therefore, published here separately.

* * *

SWINGING GUARD FOR DROP-HAMMERS

One of the latest safety devices to be adopted by the Bridgeport Works of the General Electric Co. is a swinging gate guard which is applied to board and belt drop-hammers. In the illustration, one of these guards is shown applied to a 500-pound belt drop-hammer. A single handle controls the guard as well as a safety dog just behind it which prevents the ram from dropping until after the guard has swung in front of the dies. With one movement of the handle, the dog is disengaged and the guard closed. In the illustration, the safety dog appears just behind the guard. This safety equipment is adjustable to suit all heights of dies with which the machine may be equipped.

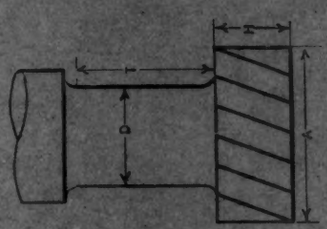


Swinging Safety Guard Applied to a Drop-hammer

MACHINERY'S DATA SHEETS 121 and 122

AMERICAN STANDARD T-SLOT CUTTERS

Approved by American Engineering Standards Committee, National Machine Tool Builders' Association, and American Society of Mechanical Engineers.



Width of Throat* †		Thickness of Cutter H		Diameter of Cutter A		Diameter of Neck D†	Length of Neck T
Standard	Nominal Bolt Size	Maximum	Minimum (Worn)	Maximum	Minimum (Worn)		
9/32	1/4	15/64	13/64	9/16	1/2	17/64	3/8
11/32	5/16	17/64	15/64	21/32	19/32	21/64	7/16
7/16	3/8	21/64	19/64	25/32	23/32	13/32	9/16
9/16	1/2	25/64	23/64	31/32	29/32	17/32	11/16
11/16	5/8	31/64	29/64	1 1/4	1 3/16	21/32	7/8
13/16	3/4	5/8	19/32	1 15/32	1 3/8	25/32	1 1/16
1 1/16	1	53/64	25/32	1 27/32	1 3/4	1 1/32	1 1/4
1 5/16	1 1/4	1 3/32	1 1/32	2 7/32	2 1/8	1 9/32	1 9/16
1 9/16	1 1/2	1 11/32	1 9/32	2 21/32	2 9/16	1 17/32	1 15/16

All dimensions in inches.

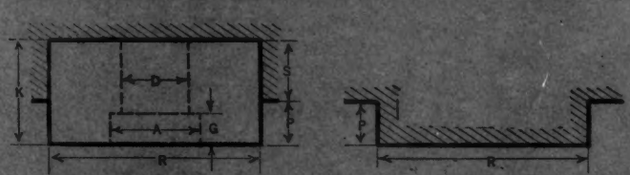
*The width of throat given in the table corresponds to the standard width for T-slots.

†In addition to the width of throat given, a secondary standard is recognized, having the width of throat the same as the nominal diameter of the T-bolt. This is to provide for the use, during the transition period, of this standard on many machine tools where it is already established. If the narrower throat is used, the diameter of neck *D* should be reduced accordingly.

The T-slot cutters listed do not agree with the sizes of such cutters which have been on the market for many years because of the provision here made for greater head space. However, it will be found that by the simplified practice recommendation of the Department of Commerce on milling cutters the old lines of cutters have been withdrawn from the market in order to reduce the varieties carried in stock. It should accordingly be possible to secure cutters of the new dimensions as conveniently and at the same price as those which were formerly listed.

MACHINERY'S Data Sheet No. 121, New Series, January, 1928

TONGUES AND TONGUE SEATS FOR T-SLOTS



Inserted or Solid Plain Types—Approved by American Engineering Standards Committee, National Machine Tool Builders' Association, and American Society of Mechanical Engineers.

Diameter of T-bolt*	Tongue Dimensions			Depth of Seat S¶	Total Thickness K	Screw Dimensions				
	Width R* †	Length‡	Projection P¶			Diameter of Screw D	Number of Screw	Threads per Inch	Diameter of Head A	Thickness of Head G
1/4	9/32	3/8	3/32	1/8	7/32	0.125	5	40	0.196	0.081
5/16	11/32	15/32	1/8	5/32	9/32	0.164	8	32	0.260	0.107
3/8	7/16	9/16	1/8	3/16	5/16	0.190	10	24	0.303	0.124
1/2	9/16	3/4	1/8	7/32	11/32	1/4	..	20	0.375	0.130
5/8	11/16	15/16	1/8	1/4	3/8	1/4	..	20	0.375	0.130
3/4	13/16	1 1/8	5/32	9/32	7/16	5/16	..	18	0.438	0.150
1	1 1/16	1 1/2	7/32	11/32	9/16	3/8	..	16	0.500	0.170
1 1/4	1 5/16	1 7/8	1/4	3/8	5/8	3/8	..	16	0.500	0.170
1 1/2	1 9/16	2 1/4	5/16	7/16	3/4	1/2	..	13	0.625	0.210

All dimensions in inches.

*In addition to the width of tongue given, a secondary standard is recommended having a width the same as the nominal diameter of bolt. This is to provide for the use, during the transition period, of this standard on many machine tools where it is already established.

†The width of tongue in the table above corresponds to the width of throat for T-slots given in Data Sheet No. 120, December, 1927.

‡The length of tongue can be varied to suit conditions.

¶The tongue projection and depth of seat dimensions given are vital only when reversible tongues are expected to be used. In some cases it may be desirable to use a greater projection *P* than called for, or to make the depth of seat *S* shallower. Such changes can be made without interfering with interchangeability.

The tolerances for widths of tongues are left to the discretion of each manufacturer to suit his requirements.

MACHINERY'S Data Sheet No. 122, New Series, January, 1928

HUMAN ENGINEERING

In his presidential address before the annual meeting of the American Society of Mechanical Engineers in New York, December 6, Charles M. Schwab, president of the society during the past year, dealt with what he termed a new field of engineering—a new science—which, for want of a better name, he called human engineering. "This," said Mr. Schwab, "is the practical science of making the men in industry substantial self-respecting men and citizens and factors cooperating in the success of the business. This new science recognizes that industry is dependent upon mass production, machine processes, and technical skill, but that the human element, after all, determines the progress of a business and the service it renders.

"Forward-looking management, as well as far-sighted representatives of employes, are coming to realize that if full benefits are to be had from the creations of engineers, industry must be viewed as a cooperative undertaking, in the advancement of which every supervisor and every employe is an important factor. They recognize that conflict between capital and labor is destructive of the interests of each; that it is unnecessary and mutually expensive.

"Herein lies a field where expert service in enlisting the interest and confidence and good will of the workers becomes just as important as the study that has been given to the characteristics and utilization of materials. To obtain that cooperation requires leadership in industry that regards itself not as partisan, but as a trustee striving to guide the efforts of both capital and labor into profitable channels."

Referring to the business in which he is engaged, Mr. Schwab said: "Our job primarily is to make steel, but it is being made under a system which must be justified. If, in addition to manufacturing products, this system does not enable men to live on an increasingly higher plane, if it does not allow them to fulfill their desires and satisfy their reasonable wants, then it is natural that the system itself should fail.

"What are these reasonable wants of employes, which they have a right to see satisfied as far as conditions of industry permit? I believe they include the payment of fair wages for efficient services; steady, uninterrupted employment; safeguarding of their lives and health; good physical working conditions; a voice in the regulation of conditions under which they work; provision for them to lay up savings and to become partners in the business through stock ownership; and finally, some guarantee of financial independence in old age."

Mr. Schwab further pointed out that high wages are of no value to a man who has no chance to earn them regularly. Hourly and daily rates mean little to a man who can work only a few days a month or a few months out of the year. Steady employment, therefore, is the important factor. Substantial progress has been made along the lines of reducing the peaks and valleys of business activity. At the Bethlehem Steel Co., where the high and low points of employment a few years ago fluctuated 50 per cent from the average, the fluctuations have been steadily reduced until in 1926 the high and low points of employment, as measured by the payroll, varied only 8 per cent from the average for the year. This regularity of work is not only of vital importance to the employe, but it has a far-reaching influence on good business conditions.

The importance of ownership on the part of the employe in the business in which he is engaged was referred to. Mr. Schwab mentioned that in the short period of four years, over 50 per cent of the employes of the Bethlehem Steel Co. have acquired 17 per cent of the company's stock. He also made reference to the representation plan, and the fundamental principles on which such representation of the workers can be most advantageously accomplished was outlined. The importance of safeguarding the life and health of the workers was emphasized, and the many benefits to the individual enterprise, the worker, and the industrial community at large were pointed out.

In conclusion, Mr. Schwab said: "Experience shows that industry's most important task in this day of large-scale production is management of men. Not only is this essential as affecting production, but it becomes increasingly more important toward the maintenance and development of industry's own markets, for, under present-day economic conditions in America, workers are more than producers—they constitute the very backbone of large-scale consumption." Mr. Schwab further stressed the point that the employer must accept responsibility for the happiness and welfare of those working for and with him, the same as he accepts responsibility for his own family.

* * *

POWER TRANSMISSION ASSOCIATION MEETING

The first annual meeting of the Power Transmission Association was held at the Hotel Commodore, New York City, Wednesday, December 7. The president of the association, W. H. Fisher, of the T. B. Wood's Sons Co., Chambersburg, Pa., pointed out that the three main aims of the association are the gathering of authoritative data relating to the problems and markets of the transmission industries; the dissemination of reliable information; and the closer cooperation of power transmission manufacturers. The association, which is only a year old, has already over 100 member companies.

An interesting survey has been made by the association on the transmission of power in industry. This survey shows that the old method of drive by lineshafting is gradually being displaced by group motor drive, and that 17 per cent of all machines are operated by direct motor drive. The advantages of group driving over individual motor drive are stated to be lower installation cost and less skilled maintenance requirements. W. L. Batt, president of the S K F Industries, and R. T. Kent, general manager of the Bridgeport Brass Co., both spoke on the value of a specialized trade association and of its relations to the American Society of Mechanical Engineers. Mr. Kent referred to the work of the professional divisions of the American Society of Mechanical Engineers and outlined methods of cooperating with that society.

Current Editorial Comment

In the Machine-building and Kindred Industries

THE OUTLOOK FOR 1928

The opinions of a large number of executives throughout the machine-building field, quoted in the leading article in this number of MACHINERY, are almost unanimously to the effect that 1928 will be a year of good business—considerably better than the latter part of 1927.

Prices, on the whole, are stable, although in some instances considered too low to insure reasonable returns on the capital invested. There are no large stocks on hand. Credit conditions are satisfactory. Labor is well employed at wages that promise continued purchasing power. The automobile industry will undoubtedly have a considerably larger output with Ford again in production. The steel industry, after the slump in the summer and fall of 1927, expects to increase operations. The extent to which the railroads will buy is always problematical, but all signs point to bigger buying activity next year. The electrical industries are looking forward to healthy business. It is not believed that the presidential campaign will interfere with business next year.

Summarizing, therefore—the opinions expressed by the industrial leaders in this number of MACHINERY point to a year of good, steady business in the machine-building industries, not a boom year, for booms are not wanted, but a steady, healthy, gradually growing business.

* * *

Machinery's Prediction Last Year

(Published January, 1927)

The prospects for 1927 are for a steady, healthy business—in some fields possibly 5 or 10 per cent less than in the peak year just ended; in some fields, approximately the same volume of business; and in others, slightly more. Manufacturers in general appreciate the fact that we cannot continue to increase business by large percentages every year, and a slight recession in the total volume, of 5 per cent or less, would not be unexpected, nor would it cause any serious concern. Generally speaking, business is in an unusually healthy condition, with every prospect that it will remain so during the coming year.

BROADER TRAINING FOR DRAFTSMEN

The term "draftsman" is elastic and is sometimes applied to any position from that of tracer up to mechanical engineer. Many mechanical draftsmen have had some training in a technical high-school or trade school, and others have spent several years at the drawing-board, starting as tracers and later working as detailers. The men who have not had the advantage of a complete technical education must continue to study during their spare time if they expect to become first-class draftsmen and designers. An engineer of many years' experience who has been in charge of a large number of men of this class in many different plants recently stated that the young draftsman is hampered neither by lack of opportunities nor by inherent mechanical ability, but principally by the lack of a thorough mechanical education.

Ample opportunities are open to young men to remedy this deficiency. Almost every town and city of any appreciable size provides evening schools that teach mechanical subjects. There are mechanical books especially prepared for study at home, and the mechanical journals furnish information on current developments that no man who expects to become proficient in his work in the mechanical field can afford to overlook. In addition to the knowledge of fundamental mechanical theory that can be obtained from books and evening classes, the successful mechanical draftsman and designer must have some practical shop experience. A good designer must thoroughly understand and appreciate the practical problems of the man who has to operate the machine that he designs. The home, and the mechanical journals furnish inbest way to learn how work is done is actually to do it, and one or more years of actual shop work is a necessary preparation for a good draftsman and designer.

* * *

GIVE TOLERANCES IF ACCURACY IS REQUIRED

When tools or machine parts are ordered from a contract shop, it is of great importance that all dimensions requiring a high degree of accuracy be plainly marked with tolerances or limits. Frequently, drawings are sent to contract shops with the dimensions on the blueprints simply given as 1.5 inches, or 3 1/4 inches, for example, with no tolerances indicated. It is usually assumed in such cases that the contract shop may exercise its own judgment as to the accuracy required.

In one instance, a contract shop that had completed and delivered an order was informed by the customer that the dimensions were in most cases 0.0005 inch too large. This, the customer stated, made the work useless for the purpose intended, and he would either return the tools to be corrected or not pay for the work. The customer was clearly at fault for not having marked tolerances on his drawings when such a high degree of accuracy was required; but as the contractor realized that he probably would be unable to force the customer to pay for the job, even though he was at fault, the work was corrected without extra charge.

It cannot be too strongly emphasized—and this has been done from time to time by MACHINERY—that drawings should be carefully marked with tolerances or limits so that there can be no doubt as to the accuracy required. When drawings are properly dimensioned with limits in every place where accuracy is needed, the workman knows when to spend time on obtaining accuracy and when not to waste time where approximate dimensions serve the purpose. A good rule to follow is to place "plus and minus" limits on all important dimensions and to leave out limits wherever the exact size is not important. The man working to the drawing then knows what degree of accuracy is required.

Tendencies in the Automobile Industry

By ALVAN MACAULEY, President, Packard Motor Car Co., Detroit, Mich.

THE most conspicuous tendency in the automobile field during the last few years has been constant improvement in the quality of the cars built, accompanied by steady reduction in price. This has been true in the case of every successful automobile manufacturer, but to quote a specific case, the Packard Six may be mentioned, the price of which, when first brought out in June, 1920, was $4950, while today it is $2285.

This reduction in price has been made possible by very large investments in handling equipment, machinery, tools, and general manufacturing facilities, and by instituting economies in methods of operation wherever possible. Such economies, however, in the case of every successful automobile manufacturer have never been allowed to interfere with quality. As a matter of fact, the gains in manufacturing efficiency have, year by year, been accompanied by improvements in the product. The manufacturing and inspection standards are as high as or higher than they have ever been, and both in materials and workmanship, the quality car of today is inherently more expensive than in earlier days when the price was higher.

Alvan Macauley, President, Packard Motor Car Co.

No industry, nor any individual company within the industry, could have achieved these results except by carefully planning its plant equipment and manufacturing processes and being willing to forego present profits with a view to laying a firm foundation for future operations. The companies that have been willing to take somewhat smaller profits and to invest the surplus earnings in improved equipment have found this to be greatly to their advantage, in that the improved equipment and methods have very soon made proportionately larger earnings possible. In most cases, a part of these increased earnings has been passed on to the buyers of automobiles in the form of reduced prices.

As an example of the large amounts expended for improvements, it may be mentioned that the Packard Motor Car Co., during the nine years from 1916 to 1924, when the dividends paid were approximately $18,000,000, spent more than twice that amount, or $36,268,000, on plant and equipment, and in the last three years, over $20,000,000 has been spent for the same purpose.

The possibilities for improved manufacturing methods have not yet been exhausted. Not only will old equipment be replaced whenever new equipment of a standard or specialized type will show a definite saving in the ultimate manufacturing cost, but entirely new methods and equipment will constantly be applied where hand-operated processes or machines were formerly used. For example, there is a constant tendency toward the use of improved conveyor equipment, and electric welding methods are being applied to an ever-increasing extent. Wherever there is an outstanding development in the machinery industry, the progressive automobile manufacturer is in the market for such equipment as will reduce his costs. There is no question but that—although so much has already been done to bring automobile manufacture into the very front line of efficient production—mechanical costs can be reduced to a still greater extent.

Ratio of Manufacturing to Selling Costs

There appears to be a widespread belief that the selling costs in the automobile industry are unusually high in proportion to the manufacturing costs. This belief is doubtless based upon the conclusions drawn by people without any definite knowledge of the facts. It is likely that the well equipped and attractive automobile salesrooms lining the prominent thoroughfares in our large cities have aided in creating this impression. But what are the actual facts?

The answer to this question is that the selling cost of automobiles is not nearly so high as that of a great many other lines of manufacture, as, for example, adding machines, cash registers, sewing machines, typewriters, radios, phonographs, pianos, and furniture. In every one of these lines, the percentage of discount is very much greater than on automobiles. In fact, in some of these lines the selling cost is so much greater than the direct manufacturing cost that the expense incident to marketing automobiles seems small by comparison. The turnover profit in the distribution

of automobiles is also very small, probably not over 3 per cent net.

In this connection, comment on the question of time payments may be pertinent. The time payment policy, when handled by conservative companies, is a sound business proposition and has given good results. It is a policy that may be safely encouraged and that is susceptible of further development along sound financing lines. Terms that may be assumed to be perfectly sound are generally based upon a down payment of one-third the price of the car, the remainder being paid in twelve equal installments.

The price level for automobiles at present appears to be quite stable, and no appreciable reductions in automobile prices seem to be contemplated in the near future. At the present time it appears to be the policy of most automobile manufacturers to produce a better and more attractive product and to hold their own in competition in that way. The prospects are for an increased total production of automobiles next year. It is likely that the output of all manufacturers, with the exception of Ford, will be about the same as this year, and with Ford included, a material increase in output may be expected.

Why Has the Number of Automobile Builders Decreased?

The question has been asked, "Why is it that while the output of the automobile industry has increased so enormously, the number of builders has decreased?" This question has already been answered in the earlier paragraphs of this article. In no industry have such great strides been made toward the production of a constantly improved product at a continually reduced price. This has meant that only those companies that possessed rare business ability and commanded exceptional mechanical talent were able to produce efficiently a product of the quality demanded by the buying public. In no industry has there ever been less of a monopoly than in the automobile industry, and for that reason, hundreds of new enterprises have been started in the last twenty years; but many of these are no longer in existence because they were not able to cope with the efficiency of those who have survived. It has been a matter of the "survival of the fittest" in the true sense of these words—that is, success has come to those who were able to give the greatest service in the form of a dependable quality product at the least cost.

Have the Railroads Lost Business Through the Automobile?

It is frequently stated that the automobile and the motor bus have taken a great deal of the passenger business away from the railroads and that the motor truck has similarly reduced freight revenues. There is no doubt that the railroads have lost local passenger business, both to the bus and to the automobile, because these provide a much more convenient means of short-distance transportation. The same is true of the motor truck for short-haul freight. But in many parts of the country the railroads have met this competition by themselves operating motor buses and trucks, and thus giving the more convenient service for both passengers and freight that these means of transportation offer.

The most important point in this connection, however, is that the automotive industry is now providing the railroads with one of its most profitable sources of freight revenue. Statistics indicate that automobiles and automobile accessories are carried at the highest freight rate and that the total volume of income from this source of freight exceeds the income from the carrying of wheat, which in former years was considered one of the most important sources of revenue of the railroads. What the railroads have lost in one direction they have, therefore, more than made up in another, and the automobile is increasing the total business of the railroads rather than reducing it.

* * *

THE STAINLESS STEEL INDUSTRY*

By JOHN C. NEALE, President
American Stainless Steel Co., Pittsburg, Pa.

The growth in stainless steel tonnage during the year 1927 has been quite remarkable, especially when it is realized that 1926 shows an 80 per cent increase over 1925; and from present indications, 1927 will show close to a 50 per cent increase over 1926. These large increases are primarily due to the growing number of products in which stainless steel is now being used, and apparently the surface has hardly been scratched, for in almost every industry it is found that extensive experiments are being conducted with a view to using stainless steel.

There are now twenty companies licensed in this country, producing stainless steel under the patents of the American Stainless Steel Co. It is available in practically all forms in which ordinary carbon steel is rolled, such as plates, shapes, sheets, bars, wire, tubes, etc., and it is also available in cold-rolled sections. Considerable progress has been made in drawing stainless steel into fine wire and into seamless tubing. It has also been experimented with for castings. These experiments have again broadened the field of stainless steel applications.

Originally stainless steel was adopted mainly because of its brilliant appearance and stainless qualities. It has now found many new uses because of its physical properties, such as corrosion resistance, toughness, strength and durability, and its resistance to abrasion, heat, pressure, etc. Whereas a year ago many stainless steel products were in a more or less experimental stage, 1927 has seen remarkable strides in the marketing of such products. Today golf clubs, valves, kitchen tools, oven linings, pump rods, cooking utensils, etc., are quite generally manufactured by the leading concerns in the respective industries. A considerable growth in tonnage during 1928 is expected.

* * *

According to a bulletin issued by the research department of the American Automobile Association, in 1926 the railroads carried 3,280,000 carloads of automotive freight, representing 9 per cent of their total freight business.

*This statement was received too late to be included in the summary "Opinions of Industrial Leaders," beginning on page 329, and is therefore published here separately.

The Business Outlook in the Machinery Field

Summary of the Opinions of Chief Executives in Various Branches of the Industry

NO business can be successfully managed without a plan, and a plan, in turn, must be based on a forecast of the future. Every successful manager forms some kind of opinion as to the coming year, for without it he would be entirely at sea. Believing that a summary of the opinions of a great many business executives is very likely to form an accurate indication of what business conditions will be, MACHINERY has, as in previous years, asked executives in every branch of the machine-building, metal-working, and machine-using industries for their views on the prospects for business in 1928. The result of this inquiry—the consensus of opinion of these hundreds of executives—is published in the following pages. A broad field of more than forty distinct metal-working industries is covered, although many of these have been grouped together in order to present a concise summary.

Agricultural Machinery and Implements

The agricultural machinery industry expects an increase in business during the coming year because, on the average, crops were fair during the past year and were sold at a price somewhat better than formerly. There has been a gradual improvement in the financial status of the farmer. A trend toward greater and more intelligent use of mechanical equipment in agricultural production is noticeable. It has been found possible to reduce costs in farm operation through the proper application of power-driven farm machinery.

With most manufacturers of agricultural machinery and implements, 1927 turned out to be a better year than was expected, several of the leading concerns reporting from 5 to 40 per cent increased volume of business over 1926, the average being an increase of about 15 per cent. It is expected that the volume of business in 1928 will exceed that of 1927 by from 10 to 15 per cent.

The Automotive Industries Expect Great Activity

The opinions of several leaders in the automotive field are quoted on pages 329, 330, and 342 of this number of MACHINERY. The industry looks forward to an unusually good year, with a volume as great as or greater than in 1926. This opinion is also reflected by parts manufacturers, who look for a 10 per cent increase over the 1926 volume. Truck manufacturers are expecting a 25 per cent increase over 1927, and bus builders are looking for very substantial business. The motorcycle business in 1927 was about 5 per cent below that of the previous year, and is not expected to change appreciably in 1928. The decrease, as compared with 1926, is due largely to shrinkage in the export business of some manufacturers.

The Ball Bearing Industry

Competition in the ball bearing field has been very keen, and due to the drop in the output of automobiles, the ball bearing business was approximately 10 per cent less in 1927 than in the previous year. It is expected that 1928 will at least equal 1926. The re-entry of Ford into production will have both a direct and an indirect effect on the market for ball bearings.

Blower Manufacturers Expect No Marked Change

The business in fans and blowers in 1927 (other than small electric fans) reported by leading manufacturers has either been equal to or possibly 5 per cent greater than in 1926. No appreciable change is expected, and it is generally believed that the volume next year will be about the same as in 1927.

Boiler Makers Expect an Increase in Business

The conditions in the boiler manufacturing field in 1927 varied considerably. The average output was about the same as in 1926, but some concerns report a reduction in business while others have had an increase of from 10 to 15 per cent. The prospects for the coming year indicate an increase in demand, estimated, on an average, to amount to about 20 per cent.

Conveying and Material-handling Equipment

Expressions of opinion from well-known concerns in the elevating and conveying equipment field are given on page 333 of this number of MACHINERY. In the factory conveyor field, business

has been as much as 15 per cent in excess of 1926, and a similar proportion of increase is expected for 1928, as compared with 1927. In equipment for the mechanical handling of materials in general, however, these results have not been obtained, and in some instances, the business has been as much as 25 per cent below that of 1926, with prospects that next year will equal the 1926 volume. More attention is being given by engineers to the study of production problems with a view to eliminating costly handling of materials. This is having a favorable effect on this branch of the industry, and will prove profitable to all concerned.

The Cutlery Industry

Cutlery manufacturers report, on an average, practically the same volume of business in 1927 as during the previous year. It is expected that in 1928 there may be an increase of from 5 to 10 per cent over 1927. The business in silverware has remained approximately the same during the last two years, and there is a favorable outlook for a somewhat greater volume of business in 1928.

The Electrical Machinery and Tool Industries

Leading executives in the electrical machinery and tool fields have expressed their opinions on the prospects for the coming year on pages 331 to 333 of this number of MACHINERY. Practically all the reports received indicate that the business in 1927 was from 5 to 10 per cent less than during the previous year, the banner year of 1926.

Almost every manufacturer in the industry expects at least from 5 to 10 per cent greater business in 1928 than in 1927—in other words, the volume expected will be about equal to that of 1926, and in some lines slightly greater. This is particularly true of electric tools.

Electric arc welding equipment will probably be in considerably greater demand next year than last year, and companies in this field look forward to nearly a 20 per cent increase. New uses are constantly being found for the arc welding process. The demand for electrically driven appliances of all kinds is growing rapidly.

Excavating and Road-building Machinery

The volume of business in excavating machinery in 1927, according to the largest producers, was approximately the same as in 1926. Others, concentrating on fewer lines, report a 10 per cent decrease in some cases, and a 10 per cent increase in others, the average remaining about the same. Approximately the same volume of business as in 1927 is expected in the coming year. Foreign trade has improved, and American excavating and road-building equipment is now shipped to practically all parts of the world, but Europe offers keen competition in this field.

Foundry Equipment

The demand for foundry equipment in 1927 has been slightly greater than in 1926, although the increase has not exceeded from 3 to 5 per cent. It is expected that in 1928 the demand will be at least 5 per cent greater than in 1927. The general conservative state of business at present, together with the easy money situation, provides a firm basis for considerable expansion in 1928. On the other hand, business in the gray iron casting field, particularly, has not been very satisfactory in 1927, and this will have an adverse effect on the buying of new foundry equipment, although some of the more progressive foundries will provide themselves with more modern equipment, in order to meet the keen price competition.

The Gear Industry

Expressions of opinion of two leaders in the gear industry are given on page 334 of this number. Progressive concerns experienced active business during the early part of 1927, but the last months of the year were very quiet. Nevertheless, several gear manufacturers report a considerable increase of business in 1927 over the previous year, and are planning for a greater increase in 1928.

It is evident that in an industry like that of industrial gear cutting there are great variations in different plants, and specific figures covering the entire industry cannot be accurately quoted. The tendency is toward a higher grade product in the entire gear business. Heat-treated gears are in greater demand, and those who specialize in the best quality of gears, therefore, have had a proportionately larger share of the business.

Grinding and Pulverizing Machinery

Manufacturers of machinery for grinding and pulverizing different materials state that the volume of business in 1927 was not so satisfactory as in the preceding year, reaching only from 80 to 85 per cent of the volume for that year. Whether the

Prospects for 1928

By Julius Klein, Director, Bureau of Foreign and Domestic Commerce

The stream of American business flows at a strong and steady current of prosperity, and we close the year with an industrial record comparing favorably with 1926 and with the machinery industry active and enjoying a strong demand for its products in most branches. Certain industries that have been slow in emerging from the depression of 1921 have made marked progress during 1927, and these will swell the main current and draw in other industries or sections of the country caught in non-progressing eddies.

On the export side, 1927 has been the most prosperous year ever experienced, if we except the abnormal war period. Exports of industrial machinery for the entire year may be expected to approximate $170,000,000, as compared with $156,000,000 for the previous year, which, in turn, was the best record for many years. The position of American machinery and American engineering in the world's markets has steadily improved in spite of the keenest competition from abroad. No one can make any positive predictions regarding the course of business in 1928. All that can be done is to point out that at the close of the year we seem to be on a sounder economic footing, nationally and internationally, than for many years. Commodity prices and stocks are low; labor employment and efficiency is high; there is an ever-increasing recognition of the machine as an essential unit in economical production and distribution, and there is an abundance of capital for investment.

volume of business in 1928 will equal that of 1926 is problematical, although it is believed that it will be an improvement over 1927; one large concern in this field expects a 10 per cent increase over 1926.

The Locomotive Business Promises Improvement

The year 1927 was not a good year in the locomotive-building field. Compared with 1926, the volume of business did not exceed 70 per cent. On the other hand, a material improvement is expected for 1928. Compared with 1926, possibly an increase of 25 per cent is not too optimistic. The railroads have been successful during the last few years in obtaining more efficient operation than formerly with the equipment already owned, but the limit of this efficiency has probably been reached, and from now on increased efficiency must be obtained by acquiring new and up-to-date equipment. The locomotive of today makes locomotives built only a few years ago obsolete. This, coupled with the prospects for continued prosperity and traffic demands throughout 1928, furnishes grounds for the belief of executives in this field that there will be a material increase in the number of locomotives ordered in 1928.

Machine Tools, Metal-cutting Tools and Tooling Equipment

The conditions in the machine tool industry are reviewed by a number of manufacturers in this field on pages 335 to 338. The volume of business in 1927 has generally been below that of 1926, but the prospects for the coming year are encouraging, and many manufacturers believe that it will be at least as good a year as 1926, and may even show a slight increase. This is particularly true in the press manufacturing business, where increases as high as 25 per cent over 1926 are expected.

In the metal-cutting tool field—taps, dies, twist drills, reamers, milling cutters, etc.—the volume of business in 1927 has been considerably below that of the previous year, due largely to the falling off in activity in the automobile industry. Manufacturers of twist drills and reamers state that their business in 1927 was, on an average, 10 per cent less than in 1926. They expect an improvement in the early part of 1928. In the tap and die industry, the falling off has been even greater, varying from 20 to 30 per cent. In this field, however, a much better year is expected in 1928. The effect of automobile plants running to capacity, or nearly so, will be marked.

In the tool equipment field—dies, jigs, fixtures, and gages—several leading manufacturers report that business has been from 10 to 15 per cent less than in 1926. An improvement is looked for, but it is not expected that the volume will exceed that of 1926, except in a few instances where this year's business has been unusually good and where, on the strength of this, a still further increase is expected in 1928.

The Mining Machinery Industry

In the mining machinery field, most manufacturers report that there was not a great deal of change in 1927 as compared with 1926. The prospects for the coming year, however, are quite satisfactory, as the demand for modern coal mining machinery will probably increase, especially for equipment for the mechanical loading of coal under ground. The foreign demand is also growing, and this will continue to increase still further with better financial conditions abroad.

Paper and Pulp Mill Machinery

From the sources from which information has been obtained, it appears that the volume of business in this industry in 1927 has not been quite so great as in 1926—possibly 5 per cent less. This was expected at the beginning of the year. On the other hand, the prospects for the coming year are somewhat brighter, and an increase of 10 per cent in the volume of business over 1927 is confidently expected.

Power Plant Machinery and Equipment

In the power plant equipment field generally, 1926 was an unusually good year, and it was hardly expected that 1927 would measure up to it. In general, it has not done so. However, better results are expected in 1928, and most companies in this field anticipate a volume approximately equal to that of 1926. In hydraulic turbines, the average business during 1927 was 80 per cent of that in 1926, with an expectation of a volume equal to 1927, in 1928.

In large gas engines, the last two years ran about equal, with an anticipated increase of 10 per cent for 1928. Better buying of engines for general industrial purposes is expected, and some railroad business is anticipated by the Diesel engine manufacturers. In small farm engines, the average for the year just closed seems to be about 10 per cent below 1926, with a slight increase expected for 1928.

In the power transmission equipment field, some companies report about the same business in 1927 as in 1926, while the business of others has been from 5 to 10 per cent less. The prospects for next year are that business will about equal that of 1926, one manufacturer expecting a considerable increase.

Machinery for the Publishing Industry

Two expressions of opinion from the printing machinery field are given on page 339. One manufacturer of bookbinders' equipment has had a volume 25 per cent greater than in 1926 and expects approximately the same volume in 1928. Another, however, has had 25 per cent less volume and does not expect a great improvement during the coming year. In the printing and binding industries, old and out of date equipment is giving place to modern machinery which reduces labor cost. Keen competition in other lines of business in 1928 may possibly increase the use of printing as an aid in furthering sales. This would give an additional stimulus to machinery in this field.

Pumps and Pumping Equipment

A great variety of opinions are expressed in regard to the volume of business to be expected next year in pumps and pumping equipment. All manufacturers seem to be unanimous, however, in expecting much better business than in 1927, because

during the year just closed several manufacturers did not have as good business as in 1926, one reporting one-third less and others 5 per cent less, while only one reports a 7 per cent increase. It is generally expected that the volume of business in this field will be at least equal to 1927 and, in some cases, as much as 25 to 30 per cent greater.

Rolling Mill Equipment

There was not so much activity in steel mill equipment in 1927 as during the two years preceding (see pages 340 and 341). The average of the reports received indicates a 10 per cent decrease. It is not generally expected that there will be much, if any, increase in 1928, although two leading manufacturers in this field look forward to a fair year. The steel mills have already replaced a great deal of obsolete equipment, and although a substantial increase in steel output is expected during the early months of 1928, it is not believed that this will augment the demand for new rolling mill equipment to any appreciable extent.

Shipbuilding

To anticipate very far in advance what may be expected in the shipbuilding business is very difficult. On the whole, the activity of leading yards on the Great Lakes and the Atlantic seaboard in 1927 was about equal to 1926 or slightly greater. It is not likely that there will be any appreciable change in 1928. On the Atlantic seaboard the dry dock business has been about the same for three years, and there is every reason to believe that it will remain at about the same level during the coming year.

Textile Machinery—Woodworking Machinery

The textile machinery field is dealt with on page 341 of this number of MACHINERY. The volume of business in this field varies considerably according to the type of machinery built, and while some manufacturers report from 5 to 30 per cent below the 1926 volume during the year just closed, others have exceeded that volume by from 2 to 12 per cent. The prospects for 1928 are that the textile machinery business in general will be from 5 to 10 per cent greater than in 1927.

Reference to the woodworking machinery industry is made on page 342. Generally speaking, conditions in this industry in 1927 were not satisfactory, although some manufacturers have been able to maintain their volume of business. The price situation has left much to be desired. The prospects for 1928 are problematical, and most manufacturers hesitate to give definite forecasts. The great strides that have been made in this field in developing self-contained motor-driven units have aided greatly in promoting business.

Summary of MACHINERY'S Survey

If a summary is made of the statements in the present article relating to different industries, it will be found that the prediction of a year ago, that business in 1927 would see a slight recession in the total volume, as compared with 1926, has proved to be correct. Business in 1927 has averaged from 5 to 10 per cent below that of 1926. The prospects for 1928 are for a conservative, steady, healthy business, showing early in the year an improvement over 1927, with a total volume of business possibly 5 or 10 per cent greater than that for the year just ended. In some fields, approximately the same volume of business is expected, while in a few, special conditions indicate a slightly smaller volume. Business is on a firm, healthy basis, with prospects of remaining so during 1928. It is not generally believed that the presidential election will have any noticeable effect on the volume of business.

LICENSING OF ENGINEERS IN NEW YORK STATE

The office of the attorney general of the state of New York has requested the publication of the following notice relating to the licensing of engineers in the state:

"This office has been officially notified that there are many engineers on the rolls of the engineering societies of this state who are not duly licensed to practice or who have failed to renew their certificate as provided by Article 55 of the Education Law. Up to now it was considered expedient to refrain from pushing this matter, thereby giving the engineers of the state ample time to become familiar with the law and its requirements and to comply therewith. Several years have elapsed since the passage of this act and this office has been requested to proceed against all delinquents."

The engineering societies have been requested to bring this matter to the attention of their members. Of course, in all the engineering societies there are many members who are not actively engaged in the practice of engineering at the present time, so that it would not be necessary for every member of an engineering society to obtain a state license. Those who wish to ascertain their status definitely should obtain a copy of Article 55 of the Education Law.

* * *

WELDING CONFERENCE

The third annual conference of welding held at Purdue University, Lafayette, Ind., took place December 13 to 15 under the joint direction of the engineering extension department and the department of practical mechanics, with the school of chemical engineering and the manufacturers of welding equipment cooperating. The discussions covered electric, thermit, and oxy-acetylene welding as applied to manufacturing operations. There were also exhibits and demonstrations of modern welding equipment.

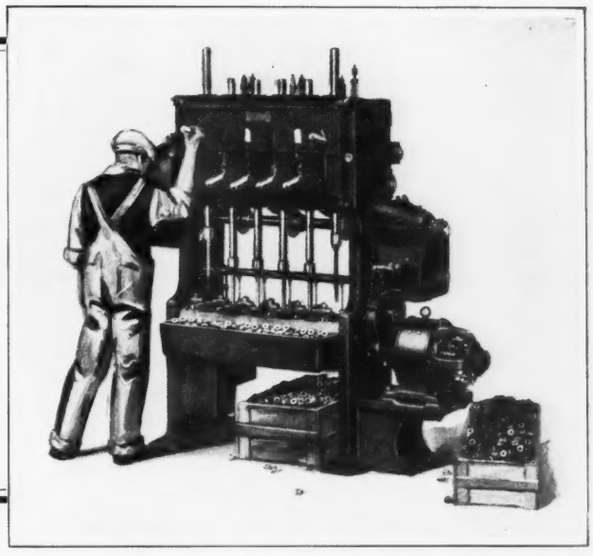
* * *

AUTOMOTIVE ENGINEERS' ANNUAL MEETING

The annual meeting of the Society of Automotive Engineers will be held in Detroit, January 24 to 27. The program includes a great diversity of subjects. Three sessions are to be held daily, in the forenoon, afternoon, and evening. Among the many subjects that will be discussed are aluminum alloy pistons, engine acceleration, high-speed Diesel engines, hardness and machineability of cast iron, and physical-property charts for alloy steel. In all, twenty-six different papers will be presented, and progress in automotive engineering not only in this country, but in Europe as well, will be featured. Headquarters will be at the Book-Cadillac Hotel.

Securing Best Results in Tapping

By A. L. VALENTINE, Manager, Tap and Gage Division, S K F Industries, Gothenburg, Sweden



THE speed at which a tap is driven when in use has a great influence on its length of life. The most suitable speed depends not only upon the material from which the tap is made and the material to be tapped, but also upon the design of the tap, and upon the lubricant used and its application. The subject of lubricants for tapping will be dealt with in the next article of this series.

Under ordinary conditions and with carbon steel taps, a surface speed of about 20 feet per minute is suitable for tapping cast iron with small-diameter taps; 16 feet per minute for cast iron with taps of larger diameter; 14 feet per minute for tapping machine steel; and 10 feet per minute for tapping high-carbon steel. It is impossible to give definite figures for tapping speeds for brass, because this material is available in so many different compositions, but a speed several times that suitable for steel can generally be employed. In tapping with taps made from high-speed steel, it is safe to use speeds about twice those recommended in the foregoing.

The accompanying table gives the surface speed and revolutions per minute for taps of different diameters. The surface speeds are given in uneven numbers of feet per minute, as they have been reduced from a table in the metric system. This table is for general guidance only. The correct speed in each case should be obtained by first trying the speed given in the table and then increasing

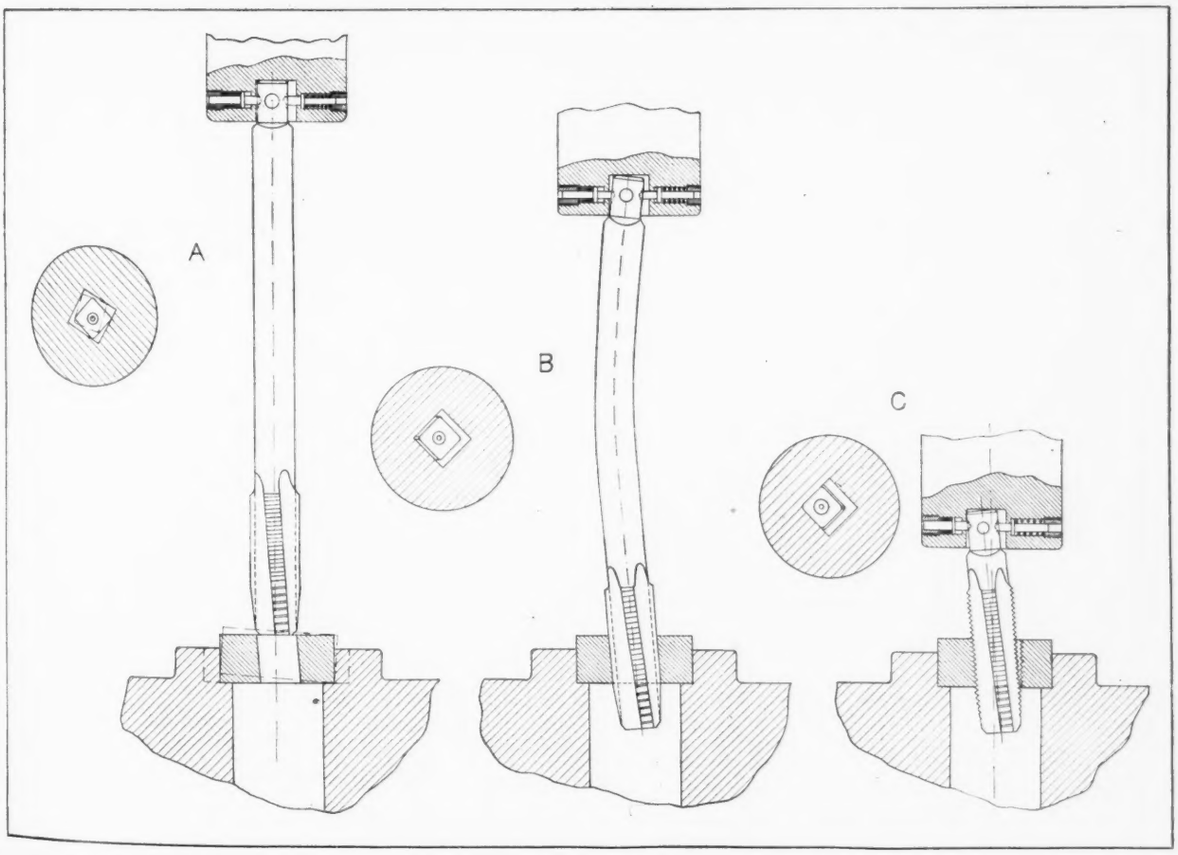


Fig. 1. Diagrams Showing Exaggerated Conditions Existing when Tapping, if Tap or Nut is Improperly Held, or Hole in Nut is not Parallel with its Sides

Tapping Speeds for Machine Tapping of Nuts with Carbon-steel Taps

Diameter of Tap, Inches	Revolutions per Minute Corresponding to Peripheral Speed, in Feet per Minute, Given at Head of Columns					
	10 Feet	13 Feet	16½ Feet	19¾ Feet	23 Feet	26¼ Feet
1/4	..	200	250	300	350	400
5/16	..	160	200	240	280	320
3/8	..	130	167	200	233	260
7/16	..	115	143	172	200	230
1/2	..	100	125	150	175	200
9/16	..	89	111	133	155	178
5/8	..	80	100	120	140	160
3/4	..	67	84	100	117	134
7/8	..	57	72	86	100	114
1	38	50	63	75	88	100
1 1/8	33	45	56	67	78	90
1 1/4	30	40	50	60	70	80
1 3/8	27	36	46	55	63	72
1 1/2	25	33	42	50	58	66
1 5/8	23	31	39	46	54	62
1 3/4	21	29	36	43	50	58
1 7/8	20	27	33	40	47	54
2	19	25	31	38	44	50
2 1/4	17	22	28	33	39	44
2 1/2	15	20	25	30	35	40
2 3/4	14	18	23	27	32	36
3	13	17	21	25	30	34

Machinery

or decreasing it according to the results obtained. This applies particularly to commercial nuts, in which the material varies greatly, so that it is not possible to predetermine with any degree of accuracy the correct speed for every case.

The speeds suggested presuppose that during the tapping a constant stream of good lubricant reaches the cutting points of the tap threads. For tapping steel and iron, animal oils are recommended by the author, such as pure lard oil and whale oil. "Stearin" oil, which is pure oleic acid, also called olein, is excellent. For cast iron, a strong solution of a good cutting emulsion is used. Do not, under any circumstances, use machine oil as a lubricant for tapping.

Methods of Holding Taps and Nuts while Tapping

There are several points to be observed in holding a tap or nut during a tapping operation. Too large holes, bad threads, short life, and tap breakage are often attributed to faults in the taps, when the real trouble is that the taps or the nuts to be tapped are incorrectly held for the tapping operation. It is of the greatest importance in tapping that either the tap or nut, or both, be held sufficiently free, or in a "floating" condition, to enable one to center itself freely with the other.

Figs. 1, 2, and 3 show several faulty conditions frequently met with in tapping. Each of these will cause faulty holes with bad or torn threads and produce unnecessary strains on the taps, so that they break or are otherwise spoiled and lose their usefulness long before their life should be spent.

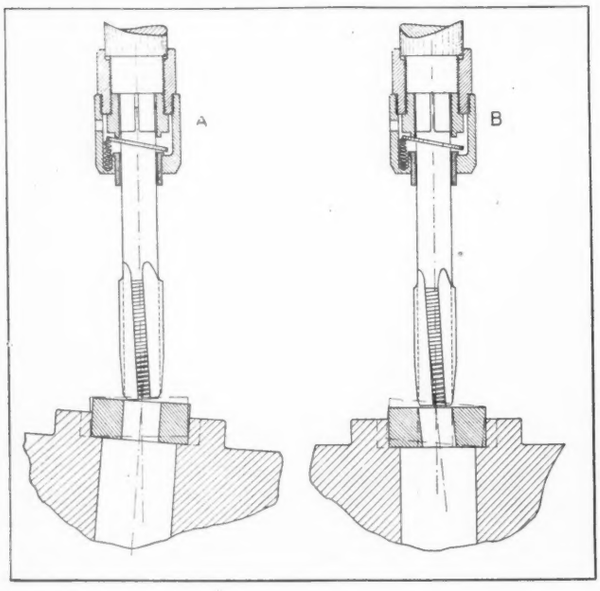


Fig. 2. Diagrammatic Illustrations Showing why Nuts should be Held in a Floating Holder when Tapping

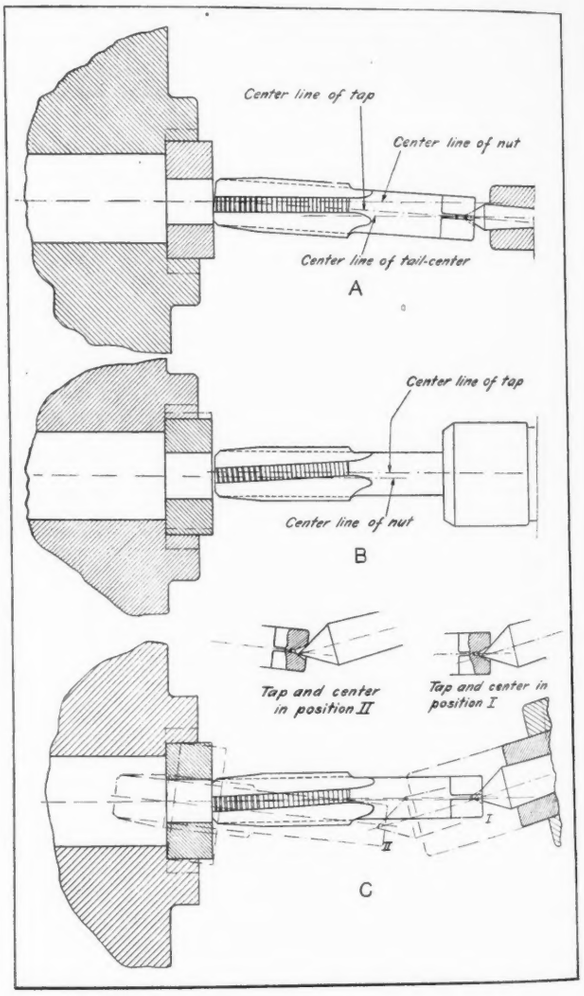


Fig. 3. Examples Showing in Exaggerated Diagrammatic Form Different Conditions Met with in Tapping

The most serious conditions shown are doubtless those where the hole in the nut is not parallel with the outer sides or not at right angles to the bottom, and the nut is held in such a way that it has not sufficient freedom to compensate for this fault in the nut blanks.

In Fig. 1, at *A* an example is shown where the nut is correctly located, but where the hole in the nut is not parallel with the outside. At *B* is shown the same case as at *A*, but with the nut partly threaded. In such a case, the shank of the tap, if it is sufficiently long and slender, will spring. The hole in the nut is not threaded at right angles to the top or bottom side of the nut. The hole will also be tapered and have poor threads.

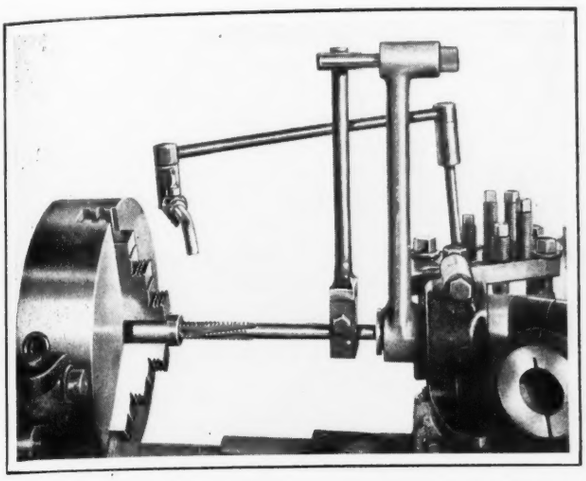


Fig. 4. Method of Mounting Tap in Turret Lathe

At *C* is shown the same conditions as at *A* and *B*, but here the tap has so short a shank that it cannot spring. In that case, the threaded hole will be practically at right angles with the top and bottom sides of the nut, but the threads in the nut will be tapered to a marked extent, and irregular.

In Fig. 2, at *A*, is shown a condition where the tap is correctly located, but where the hole in the nut is at an angle with the center of the tap. The hole in the nut is correctly located with relation to the nut itself. The tap is held firmly in its holder. In such a case, the tap is subjected to severe strains in operation. Even though the nut is free in its holder, the hole tapped in it will not be at right angles with the top and bottom of the nut.

At *B*, Fig. 2, is shown a case where the tap is correctly located, and the nut is also properly located, but the hole in the nut is not parallel with the sides of the nut and is at an angle with the center line of the tap. The tap is firmly held in its holder. The same unsatisfactory results are obtained as in the example illustrated at *A*, even though the nut is free to move in its holder.

In Fig. 3, at *A*, is shown a case where the nut and its hole are correctly located and where the center line of the nut and of the tail-center are parallel, but not in alignment. The top is subjected to severe strains in a case of this kind, if the nut is held firmly in its holder. If a fairly accurate hole is to be threaded in the nut, it must be free to move in its holder, as indicated by the dotted lines.

At *B* is shown a case where the nut and its hole are correctly located, and the center line of the hole in the nut and the center line of the tap are parallel, but not in alignment. If both the tap and the nut are firmly held in their holders, the tap is subjected to severe strains. In order to produce a reasonably correct threaded hole, the nut must be free to move in its holder, as indicated by the dotted lines, or the tap must be free to move in its holder a corresponding amount.

At *C* is shown a case of lack of alignment, the conditions being considerably exaggerated in order to illustrate the principle. The center line of the tail-center is at an angle with the center line of the tap and the hole in the nut. Note the changed conditions of the tap as the tail-center is moved forward during the tapping. No matter how much freedom the nut has in its holder, a poorly threaded hole, tapered, and with the thread angles in wrong positions relative to the center line of the nut, will be the result. If the nut, as is often the case, is held firmly in its holder, the errors in the threaded hole will be still more pronounced. The tap is also subjected to very severe strains and the bearing of the tail-center in the center hole of the tap is very unsatisfactory.

A nut holder which in all respects compensates for reasonable inaccuracies found in nuts, is naturally quite complicated, as it must give the nut sufficient play in the holder in all directions. Such a holder is shown in Fig. 5. It can easily be modified so that it could be applied to most nut tapping machines.

Tapping with Acme and Square-thread Taps

It is quite easy to tap by hand or in a machine with ordinary hand taps, machine taps, or tapper taps, as compared with tapping in a machine with Acme or square-thread taps. It is difficult for the taps in either of these two types, on account of the steep thread angle and wide tap thread surfaces, to take hold in the hole to be tapped. Both types have a tendency to ream out the hole instead of threading, unless they are provided with a guide of the construction shown in a previous article of this series (September MACHINERY, page 57).

If the threading is done in an ordinary lathe or in the usual way in a turret lathe, it is also difficult for the workman to follow up correctly with the tailstock or turret while the tap feeds forward

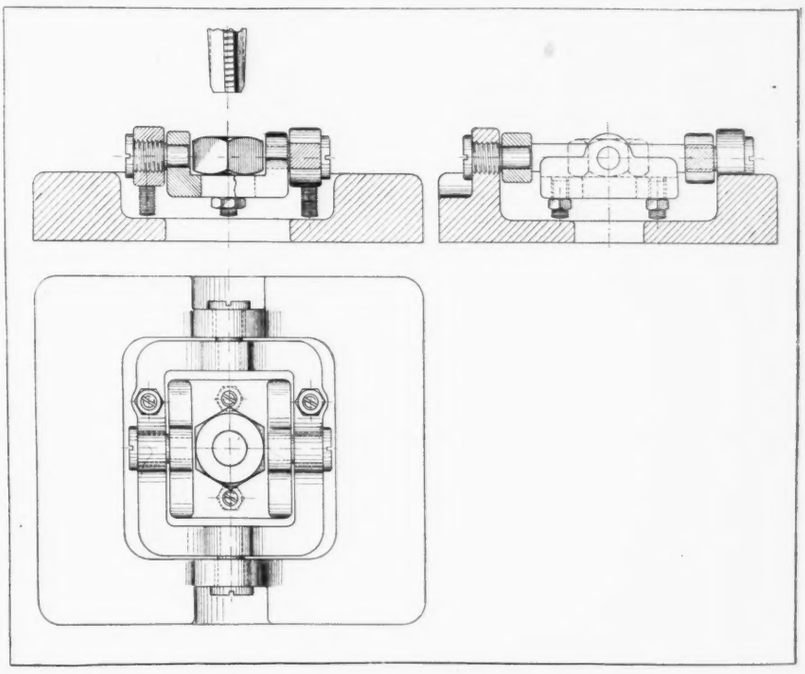


Fig. 5. A Floating Holder for Nuts to be Tapped

through the hole. Frequently, therefore, the thread spaces in the hole become too wide, because the tailstock or turret is fed forward either too quickly or too slowly. If, on the other hand, the tap is fed forward by means of a lead-screw, and if the latter does not have exactly the same lead as the tap, the results will be the same as when the tap is fed forward by hand.

In November, 1921, MACHINERY, page 198, a device was illustrated and described for tapping nuts with Acme and square-thread taps which works satisfactorily in all respects, the threading being done in a turret lathe. This device is shown in Fig. 4. The tap shank slides freely in a bushing fastened in one of the turret holes, and the tap is prevented from revolving by a vertical arm attached to the tap shank, which rests against a horizontal support mounted in the head of the turret lathe.

In tapping, the first tap is fed in until the tap has taken hold in the nut, whereupon the tap is allowed to feed itself forward. The operator has merely to feed the turret-slide forward at such a rate that the vertical arm referred to does not slide off its support, and he can neither advance nor retard the feed of the tap by so doing. The next tap in a set is then screwed into the partly threaded hole by hand until the threaded pilot takes hold in the nut, and then the tapping is continued with the tap feeding itself forward. This procedure is repeated with each succeeding tap.

Die Chasers and Threading Dies

In regard to die chasers and threading dies, it might be mentioned that it is not as necessary to grind the threads in these as it is in taps. Chasers and dies have generally a short length of thread, and in consequence the change in lead and other dimensions in hardening is small—sometimes too small to be measured. The greatest and most frequent inaccuracies in dies and chasers are caused by threading them with inaccurate taps. It is, therefore, necessary to use taps ground in the thread for threading these tools. If the threads are accurate to begin with, the change in hardening will scarcely need to be considered. The main point in obtaining good results from dies and chasers is to see that the threads are correct before hardening and that the dies and chasers are used correctly when threading screws. If incorrectly used, almost any lead can be obtained on the threaded parts, whether the chasers and dies are ground or unground, or whether the taps used for threading them are accurate or not.

Friction Tap-holders

Many tap users are employing friction tap-holders for tapping in order to prevent tap breakage. Most, if not all, of these holders require taps with special shanks, and hence, such taps are obtainable only at greater expense and after considerable delay, as compared with standard taps. However, standard hand taps can be adapted easily and without great expense for use in such holders, as shown in Fig. 6. At *E* is shown an adapter for Pearn's friction tap-holder to make it applicable for standard hand taps. Three different sizes of these holders will take care of all sizes of taps from 1/4 to 1 inch, inclusive, in diameter. At *F* and *G* are shown two other types of friction holders in which standard hand taps may be used. At *H* is shown Pearn's tapping device as regularly made, without the adapter; this view also shows a section of the special shank required on the tap for this holder.

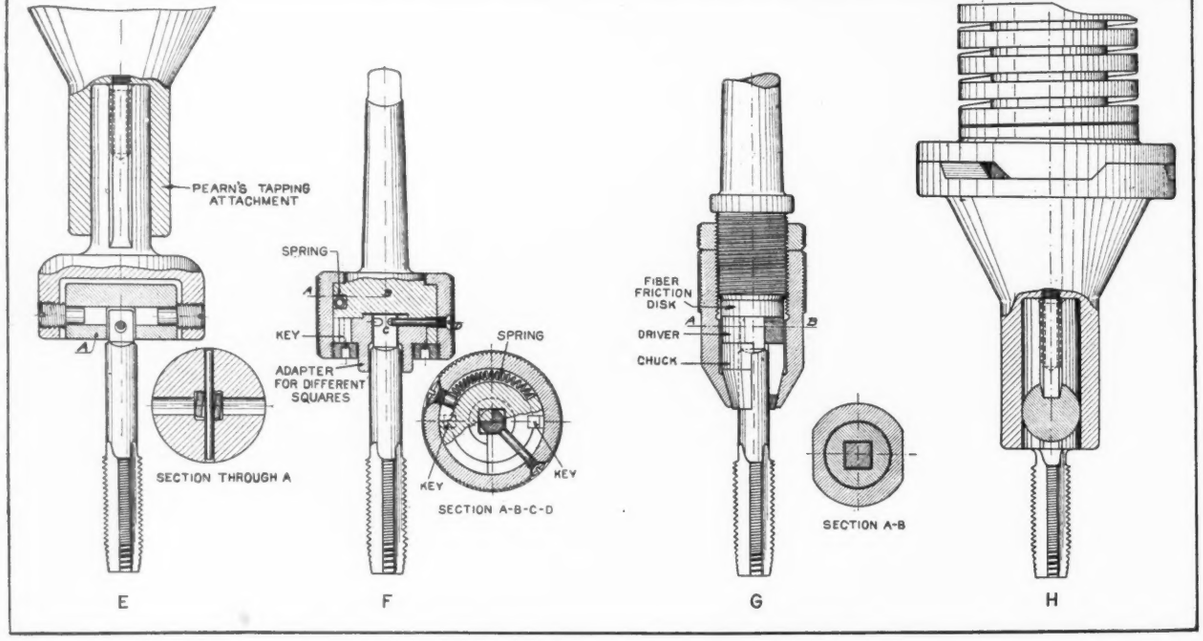


Fig. 6. Adapting Standard Hand Taps for Use in Special Friction Tap-holders

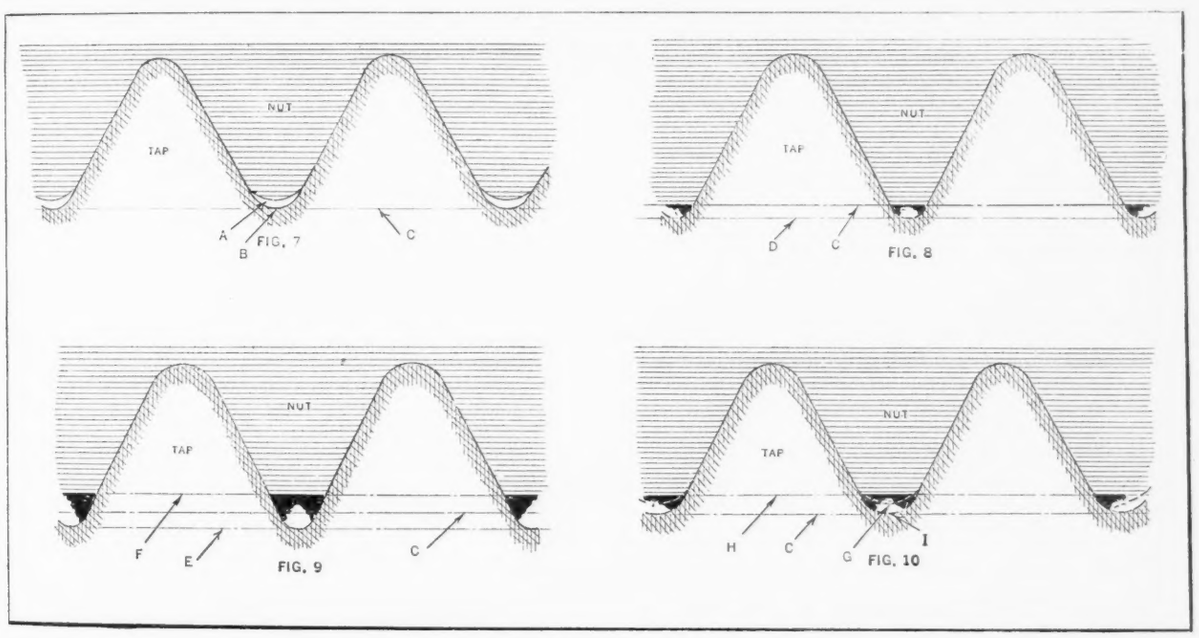
Relation Between the Root Diameter of Taps and Tap Drill Sizes

In a previous article by the writer, on the measurement of tap diameters, it was mentioned that the root diameter of taps is generally considered of no great importance. This is, however, subject to the qualification that the root diameter of a tap should be at least as great as or greater than the theoretical or nominal root diameter. Sometimes

it is argued that the root diameter of the tap should be smaller than the theoretical root diameter, because a tap should not be expected to cut with its root; and it seldom or never does, if the correct tap drill size, which should always be larger than the theoretical root diameter, has been used.

This argument is erroneous, because if the drilled hole is larger than the theoretical root diameter and the tap is smaller on its root diameter than the theoretical dimension, burrs will be produced at the root of the threads in the hole, especially when tapping tough and stringy materials, thereby preventing a plug gage with correct thread form from entering the tapped hole, in spite of the fact that the tap and the hole are larger than the plug gage on the outside and pitch diameters.

The illustrations Figs. 7 to 10 have been prepared with a view to illustrating the conditions met with. In Fig. 7 are shown two conditions—*A*, in which the root diameter of the tap is larger than the nominal size, and *B*, in which it is equal to this size.



Figs. 7 to 10. Diagrams Showing the Relation between the Root Diameter of Taps and Tap Drill Sizes

C ($=B$) is the nominal root diameter and the tap drill size. A plug gage or bolt with correct thread form will always enter the tapped hole. Any flow or distortion of the metal in the nut caused by tapping will always be entirely cut away by the tap on account of the fact that its root diameter is larger than, or equal to, the nominal root diameter.

Summary of conditions: (1) Plug gage or bolt will always enter the tapped hole (advantage); (2) tap cuts at its root, which it should not do (disadvantage); (3) liable to cause torn thread tops in the nut (disadvantage); (4) causes unnecessary power consumption (disadvantage). This condition, therefore, is not recommended on account of points 2, 3 and 4.

In Fig. 8 is shown a condition where the root diameter D of the tap is smaller than the theoretical root diameter C; the tap drill size (also C) is equal to the theoretical root diameter. A standard plug gage or bolt with standard thread form will not enter the tapped hole. Any flow or distortion of metal in the nut, as shown by the black portions, caused while tapping—because the root diameter of the tap is less than the theoretical root diameter—cannot be cut away by the tap.

Summary: (1) Plug gage or bolt will not enter the tapped hole (disadvantage); (2) tap does not cut with its root diameter (advantage); (3) top of threads in nut are not torn (advantage); (4) power consumption is normal (advantage). This condition, however, is not recommended on account of point 1.

In Fig. 9 is shown a condition where the root diameter E of the tap is smaller than the nominal root diameter C. The tap drill size F is larger than the nominal root diameter. A standard plug gage or bolt with correct thread form is likely not to enter the tapped hole. Any flow or distortion of metal in the nut, as shown by the black portions, caused while tapping, might not be entirely cut away by the tap—depending upon the amount of the flow or distortion in relation to the amount that the tap drill is larger than the nominal root diameter.

Summary: (1) Plug gage or bolt likely not to enter the tapped hole (disadvantage); (2) tap does not cut with its root diameter (advantage); (3) top of threads in nut not torn (advantage); (4) power consumption normal (advantage). This condition is not to be recommended on account of point 1.

Finally, in Fig. 10 are shown two cases. In the first case, the root diameter G of the tap is larger than the nominal root diameter C, but smaller than the tap drill size H. In the second case, the root diameter I of the tap is equal to the nominal diameter C but, of course, smaller than the tap drill size H. A standard plug gage or bolt with correct thread form will always enter the tapped hole. Any distortion of metal in the nut, as shown by the black portions, caused while tapping, will always be sufficiently cut away by the tap, because its root diameter is the same as, or larger than,

the nominal root diameter, and the tap drill size is larger than this diameter.

Summary: (1) Plug gage or bolt will always enter the tapped hole; (2) the tap does not cut with its root diameter; (3) top of threads in the nut are not torn; (4) power consumption is normal. All of these conditions are advantages and, therefore, this relationship of root diameter of tap to nominal root diameter and tap drill size is recommended.

It may be added that most troubles with taps are caused by the tap drill being too small, placing an unnecessary strain on the tap. The tap drill size should never be less than required to give the nut threads sufficient strength, and should vary with the material to be tapped and the length of the thread in the hole. Soft and tough materials require a larger tap drill than harder materials. Ordinary manufacturing requirements necessitate only 70 per cent of the full theoretical thread. This has been proved by many experiments and tests. When taps are used that are ground after hardening, and in which the lead of the thread is practically without error, the thread sides in the nut bearing fully against those in the screw, even a 70 per cent contact is not necessary. Therefore, when ground thread taps are used, a still larger tap drill size may be employed.

Nitralloy and the Nitriding Process

By H. A. De FRIES, Metallurgist, Ludlum Steel Co., Watervliet, N. Y.

NITRALLOY is the general name of a number of special alloy steels which can be surface hardened by being subjected to the action of ammonia gas for a period of from two to ninety hours (depending upon the depth of case desired), while the material is heated to a temperature of approximately 875 degrees F., without subsequent quenching. This process is termed "nitriding." The case imparted by the process will scratch glass with ease, and even special testing files are worn smooth without effect on the extremely hard surface. Nitralloy is made by the Ludlum Steel Co., Watervliet, N. Y.

Tests made upon nitrided steels have shown them to possess a remarkable resistance to metal-to-metal wear. Herbert pendulum tests, read in terms of Brinell numerals, indicate a minimum hardness several hundred points higher than the maximum hardness obtained with steels hardened by quenching. The nitrided case is fully as resistant as stainless steel to the corrosive action of fresh or salt water and moist atmosphere. Nitralloy is, therefore, an important addition to the family of rustless metals.

Nitralloy has excellent forging properties and can be machined satisfactorily in both annealed and heat-treated conditions. The nitriding process is easily performed if the essential operations are carried out with care and precision. Standard electric furnaces can easily be adapted to the nitriding process.

Composition and Uses of Nitralloy

To satisfy various requirements as to core strength, nitralloy is produced in a number of different analyses. The addition of a definite percentage of aluminum in all types of nitralloy is absolutely indispensable, both on account of the extreme hardness which this element imparts to the surface of the steel when subjected to the action of the nitrogen in the ammonia gas, and the desirable physical properties it produces in the core. Because of the fact that carbon has no influence on either the hardness or depth of the nitrided case, this element is present only for its effect on the physical properties of the core, and is used in smaller amounts than is customary in most alloy steels.

In typical nitralloy analyses, the amount of carbon ranges from 0.10 to 0.45 per cent, and the amount of chromium from 1.60 to 1.70 per cent. There may be no nickel or as much as 1.80 per cent. There is 0.60 per cent manganese, 0.25 per cent silicon, 1 per cent aluminum, 0.020 per cent sulphur, and 0.020 per cent phosphorus, and in the latest type of nitralloy, up to 0.25 per cent molybdenum.

In tests made upon various grades of nitralloy in the heat-treated and annealed condition, nitralloy showed physical properties equal to, and in most instances better than steels that conform to the S. A. E. specifications. This was especially true in regard to impact values.

Nitralloys are suitable for crankshafts, camshafts, timing gears, wrist-pins, worms, clutch and chuck parts, bushings, etc., and for many other parts of automobiles, calculating, adding and sewing machines, typewriters, shoe and textile machinery, etc.

Heat-treatment of Nitralloy previous to Nitriding

Previous to nitriding, the steel is heat-treated to impart the desired physical properties to the core, after which the metal is machined as usual. All strains set up by forging or heavy machining operations must be thoroughly relieved by annealing. After nitriding, parts that have been annealed will be free from distortion or irregular growth in proportion to the care taken in carrying out the heat-treatment. All scale resulting from forging or heat-treating should be completely removed from the surfaces to be nitrided.

Nitralloy steels forge as easily as ordinary alloy steels of the same carbon content. The low average carbon content, together with the small amounts of alloying elements present, produce ready machineability in rolled bars, forgings, and castings. In the heat-treated, as well as in the annealed condition, this steel has the same degree of smoothness and free cutting properties as the highest types of alloy

steels of corresponding strength. As most nitrided parts are put into service after only a slight buffing or grinding to remove the oxide film, it is important to note that a high degree of finish can be obtained without difficulty.

Grinding or lapping before nitriding offers no difficulties, whereas these operations become more difficult after nitriding because of the hardness of the case. If at any time in the processing, parts show deformation greater than can be removed by subsequent machining, and a straightening operation is necessary, an additional annealing at 1000 degrees F. for from 6 to 8 hours, should be employed after the straightening operation. Rough- and finish-machining operations need not deviate from existing shop routine, but the work should be annealed at 1000 degrees F. between the two machining operations. In designing and preparing parts for nitriding, care should be taken to see that all sharp edges are relieved and suitable fillets used to avoid any tendency toward chipping the hard case.

The Nitriding Process and the Equipment Used for It

The nitriding operation is preferably carried out in an electric furnace, the temperature of which can be closely controlled around 875 degrees F. The parts to be nitrided are placed in a gas-tight box which is provided with inlet and outlet tubes to permit circulation of the ammonia gas. Generally, an asbestos washer is used between the box and the lid, and asbestos packing is employed in the stuffing-boxes for the gas pipes. The latter are generally made of nickel, whereas the box and lid are either cast or built up from "Delhi" chrome iron. The parts to be hardened are placed loosely in the box without packing material, but the individual layers are separated by nickel wire netting to permit free circulation of the gas. The box with the gas connection is then rolled into the heating chamber and the door opening sealed. The flow of the gas is regulated by a needle valve furnished with the ammonia cylinder, which is connected by rubber tubing to the inlet pipe.

A modification of the box type furnace is the retort furnace in which the interior retort, integral with the furnace, is built of "Delhi" chrome iron with a door at one or both ends. These doors must be designed so that they may be made gas-tight by means of packing rings and clamping devices. The ammonia inlet pipes can be arranged on the sides of the furnace, and the outlets on top so as not to interfere with work entering or leaving the retort chamber. By making the bottom of the retort flush with the floor, work can be placed on racks or trays carried on cars and the cars rolled in at one end of the furnace and discharged at the other end. This design of furnace is particularly suitable with large quantities of material.

In the nitriding process, the two essential requirements are to keep the flow of ammonia fairly constant and to hold the temperature steady. The flow of ammonia can be looked after by the operator and rarely requires attention, whereas an automatic furnace control will take care of the temperature. Threaded and other sections of parts that must be kept soft can be protected from the nitriding action of the ammonia gas.

Depth and Hardness of Case

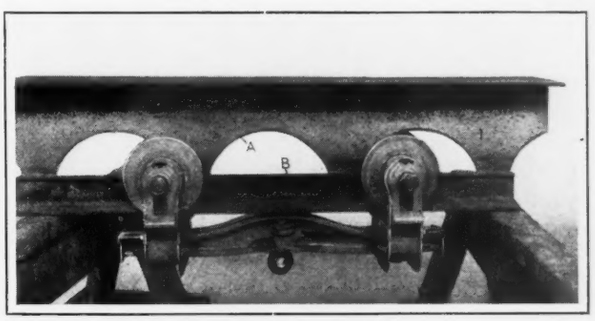
The case produced by the full ninety-hour nitriding treatment is approximately 0.031 inch deep. About one-half of this case is of extreme hardness, the hardness decreasing gradually until the case merges into the core without any line of demarkation. The outermost part of the nitride case is not so hard as the zones immediately below it, and to get the best results, it is advisable to remove from 0.001 to 0.0015 inch from the diameter. This stock is usually removed with fine emery cloth or by buffing or grinding before the parts are put in service.

For sections that must be produced to close tolerances, the nitriding process offers the advantage that the work may be finished practically to the desired dimensions without fear of material distortion during the hardening. In nitriding, there is a slight growth due to the absorption of nitrogen, but the change in dimensions is very slight. The growth can be allowed for in finishing the piece for hardening or it may be calculated to provide material for lapping operations after hardening, thus rectifying any slight movement caused by the presence of unrelieved strains. Inasmuch as the temperature at which the nitriding or hardening treatment is carried out is around 875 degrees F., the nitrided case retains its hardness when it is reheated, and remains file hard up to at least this temperature.

* * *

WELDING MANGANESE STEEL TRACK TO TRAM RAIL GIRDER

An arch beam for overhead tram rail systems, which consists of a punched mild steel girder beam *A* welded to a high-carbon, high-manganese steel rail *B* is shown in the accompanying illustration. The mild steel beam can be punched for bolts or rivets, and the manganese steel rail provides a fine



Girder for Tram Rail System Made by Welding Track B to Mild Steel Beam A

wearing surface for the carrier wheels which will not peen or flatten under the pounding of heavy loads. Rails made from manganese steel also take a high polish which reduces friction.

An electric welding machine made by the Lincoln Electric Co., is used by the Cleveland Crane & Engineering Co. in the manufacture of these composite beams. Without welding it would be impossible to produce these beams commercially, as punching the hard manganese steel rails would be out of the question, and drilling holes for clips at the close intervals required in this case would be too costly.

Fig. 1. Air-operated Chuck Open, Ready to Receive Automobile Flywheel Ring Gears

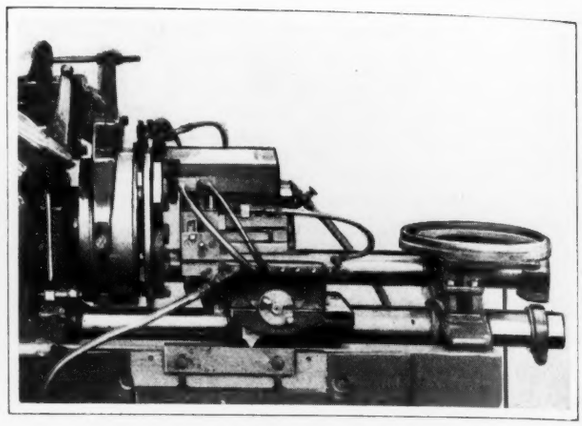


Fig. 2. Chuck Holding Flywheel Ring Gears for First Operation

Air-operated Chucks for Automatics

By O. S. MARSHALL

RECENT improvements in methods of holding automobile flywheel ring gears for machining makes it possible to turn these parts complete at the rate of forty finished blanks per hour. This record is for blanks, the finished size of which is 15 7/16 inches outside diameter, 14 7/16 inches inside diameter, and 11/16 inch wide. Four Fay automatic lathes equipped with special air-operated chucks, attended by two operators, are required for this job. The air cylinders are positioned at the rear of the machine and are operated by a foot-treadle.

The tooling is comparatively simple, and will be readily understood from the illustrations, the chuck constituting the chief point of mechanical interest. The chucks are of steel throughout; all wearing parts are hardened and ground, and are so designed as to afford minimum trouble from clogging or fouling.

Turning, Facing, and Chamfering Flywheel Ring Gears

The first operation consists of straddle-facing the two sides, turning the outer diameter, and chamfering both edges on the outside diameter and the outer edge of the inside diameter. Both roughing and finishing cuts are taken in this operation. The finish-facing cuts are performed by the back stroke of the tools, the machine automatically shifting to a higher speed for this. Seven turning tools are used, four on the back arm and three on the front carriage. The blank is gripped internally, and it is positioned on the chuck by a locating ring. When the machine starts and the tools begin their work, the locating ring automatically recedes from the blank. The tooling used for this operation is illustrated in Fig. 2.

The relatively small cross-section of these ring gears necessitates great care in holding them, so that they will be free from distortion and ready to have the gear teeth cut in them when finish-machined on the automatics. To insure this freedom from distortion, there are twelve scored contact points (about 5/8 inch arc bearing) on six swivel jaws. These jaws, in turn, are mounted on three main swivel members, which are substantially supported on the three radially moving jaws of the chuck. This gives an equalizing or "whiffletree" adjustment for the work. The twelve contact surfaces adjust themselves automatically with the ring, while the major radially sliding jaws insure the concentricity of the entire mechanism.

The details of the chuck used in the first operation are shown in Fig. 5. The locating ring or sleeve *A*, against which the blank is placed when put on the chuck, is keyed so that it can be slid on

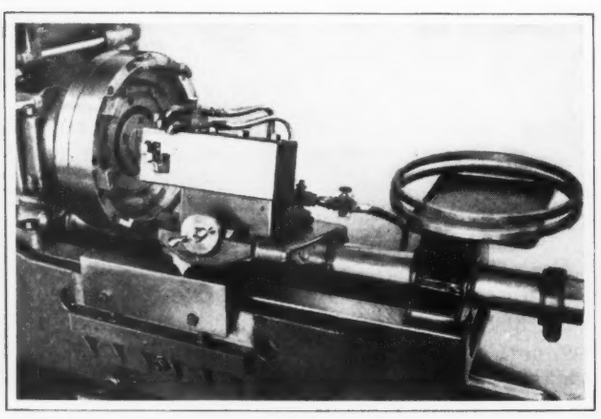


Fig. 3. Air-operated Chuck Used in Second Operation on Flywheel Ring Gears

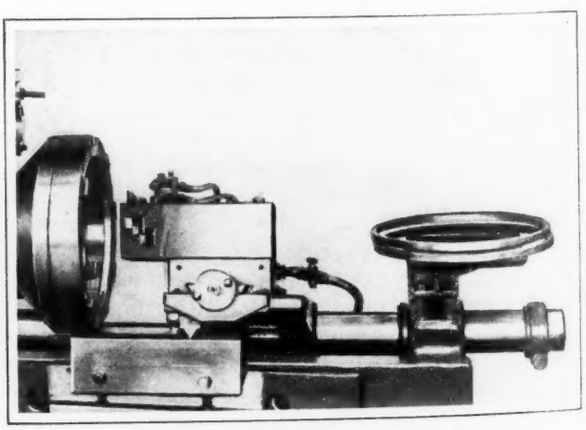


Fig. 4. Chuck with Flywheel Ring Gears in Position for Second Operation

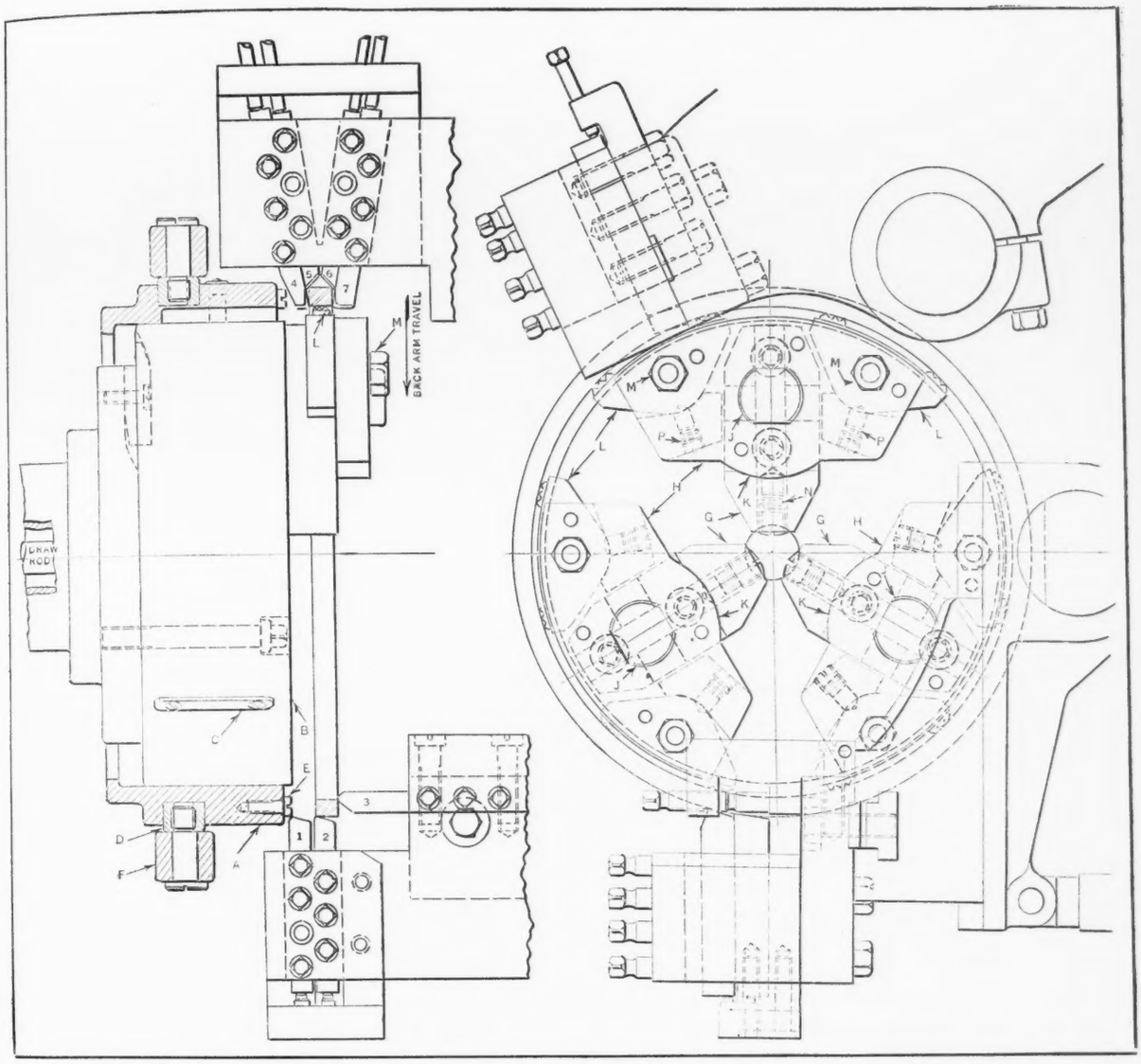


Fig. 5. **Details of Chuck for Holding Flywheel Ring Gears for Turning, Facing, and Chamfering**

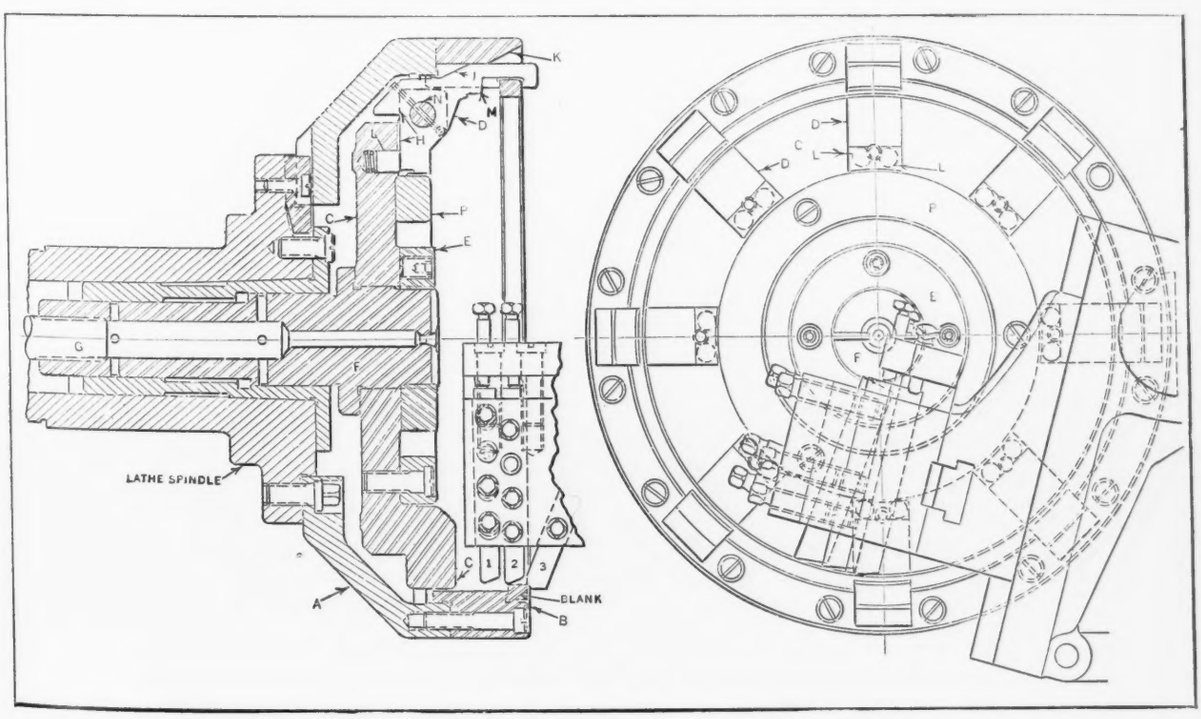


Fig. 6. **Details of Chuck for Holding Flywheel Ring Gears for Rough- and Finish-boring and Chamfering**

the main body *B* by key *C*. The chuck control ring *D* is split for assembling in the groove of sleeve *A*. Twelve face contact points are provided by the screws *E*, to align the blank. Sleeve *A* is connected through yoke *F* and levers, with a cam on the machine drum, and the sleeve is advanced and withdrawn at the proper time through the action of the cam.

The radially moving jaws *G* support the main swivels *H* by the massive studs *J*. These swivels are additionally supported by the jaws *G* through the circular contact *K*. The work-contact swivels *L* are supported by the main swivels *H* through the bolts *M*. While all swivels are free in their movements, each is held by a spring, as shown at *N* and *P*. With this arrangement, the mechanism is kept in place, and at the same time, sufficient freedom is allowed for self-adjustment.

Boring and Chamfering Operations

The second operation, the tooling for which is shown in Figs. 3 and 4, consists of rough- and finish-boring, and chamfering the single remaining corner. Only three tools are required, and these are positioned on the front carriage. The machine shifts automatically to a higher speed for the finishing cut, as in the first operation. The foot-operated air chuck permits the operator to use both hands in placing the blank in position. The blank is supported around its entire periphery within a hardened and ground ring. Pressure on the foot-treadle brings into action eight clamping jaws, which draw the blank into the chuck. When the operation is completed, the foot-treadle is again actuated to reverse the operation of the air piston, thus causing the clamping jaws to expel the blank from the chuck.

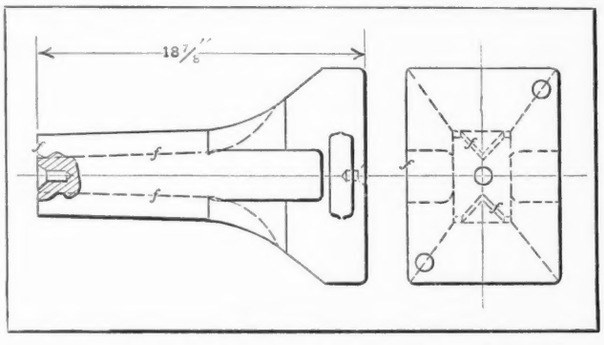


Fig. 1. Friction Draft Gear to be Milled and Drilled

The details of the chuck used for the second operation are shown in Fig. 6. The outer portion of the chuck consists of two rings *A* and *B*. Ring *A* is bolted to the lathe spindle, and *B* is bolted to *A*. Ring *B* supports the blank. Member *C* carries eight clamping jaws *D*. Ring *C* is secured by the large nut *E* to the plunger *F*, which is directly connected with the air piston *G*. Ring *C* is slotted suitably to support the clamping jaws as shown at *H*. The jaws are beveled at *J* to match a corresponding bevel on the supporting ring at *K*. Spring-actuated plugs *L* press against the inner ends of the clamping jaws, which are pivoted on the pins *N*.

When the finished blank is to be freed from ring *B*, the forward movement of ring *C* thrusts the eight clamping jaws forward. The shoulders *M* on the jaws, which are above the center of pins *N*, press against the rear face of the blank and allow the spring-actuated plugs *L* to throw the jaws open when the two bevels *J* and *K* coincide. The finished blank is then removed and another blank inserted. The extra ring *P* is for excluding chips from the jaws.

MILLING FRICTION DRAFT GEARS

By HOWARD ROWLAND

The milling and centering of draft gears, such as shown in Fig. 1, required in the past several handlings, occasioning unusually high cost for these machining operations. This led to a study of various methods with a view to decreasing the cost of the operations. The result was that several of the operations were combined so that they could be performed at one setting. A method of mill-facing one end, mill-facing the riser, and at the same time centering the piece, as indicated in Fig. 1, was adopted after a conference between the milling machine manufacturer and the National Malleable & Steel Castings Co., the user of this equipment.

It was necessary to locate these pieces very accurately, because after the centering and the milling operation shown in Figs. 2 and 3, there is a subsequent operation, illustrated in Fig. 4, which consists of milling the V-groove on an index fixture. The grooves are 180 degrees apart, or diametrically opposite each other.

In the first operation, the draft gear rests on two locating points at the flange end and on a single point at the small end. The single point is adjustable, and can be seen under the work at *A*, Fig. 2. Two V-gages *B* are slid into position by the operator to check the centering of the work before center-drilling, and to be sure that there is enough material for the following operation of milling the vee. The adjustable point is moved up or down to suit the V-gages, after which the gages are moved away.

Means are also provided at this end for centering or equalizing sidewise, consisting of sliding blocks *C* operated by a screw *D* with a right- and left-hand thread. The dovetailed sliding blocks are V-blocks which engage the vee in the work, thus locating this end for the centering operation. The piece is clamped down at the small end by means of a drop-clamp *E*, which pivots on one side and has a swinging or hinge bolt at the other side that clamps the piece down securely on the three locating points. The work is held square in the fixture by clamping the face of the flange against two buttons. The rear end of one of the clamps can be seen at *F*.

The work is loaded at the right-hand side of the fixture and then indexed to bring it into position for milling the face of the small end and the riser. After milling, it is indexed back, and the centering attachment *N* is lowered into position by means of a handwheel *G*. The centering fixture is pivoted at a point *H* just above this handwheel, and it is bolted down so that the relation between the centers and the work fixture is constant.

The feed of the center drills *J*, one of which is at each end of the work, is controlled by means of a single handwheel *K*. Both center drills are fed

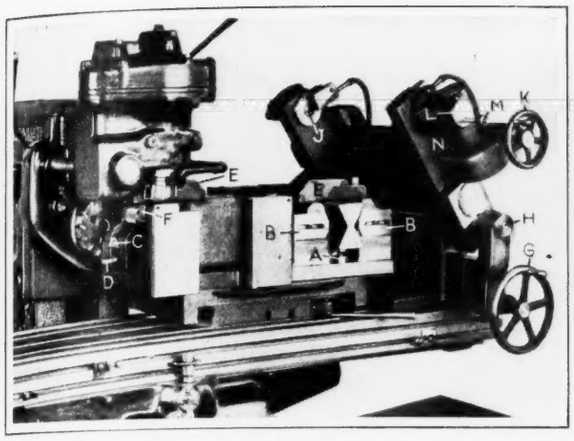


Fig. 2. Set-up for Milling and Center-drilling Friction Draft Gears

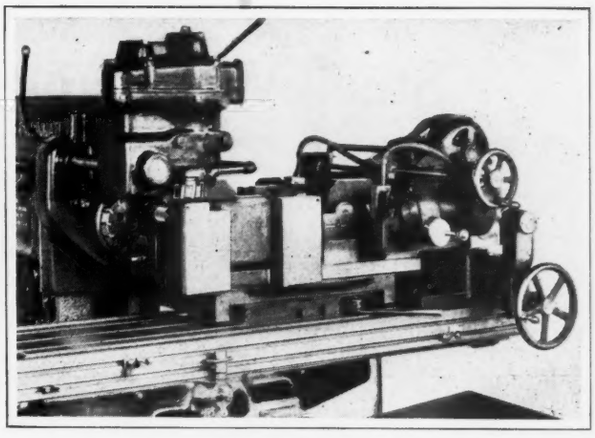


Fig. 3. Face-milling and Center-drilling Friction Draft Gears

by a rack in the quill *L*, and driven by means of a worm and worm-wheel. Adjustment is provided through a coupling on the worm-shaft so that the position of the center drills can be varied. There is also an end-stop *M* provided on the quill of each center drill so that the proper center drilling depth can be maintained. The center drill spindles are driven by means of a silent chain from a drive shaft running through the pivot center of the centering attachment. The drive shaft is driven by a motor mounted at the rear of the centering fixture.

The cutting lubricant is piped from the machine lubrication system, and a stream of lubricant is played on both center drills during the operation. The draft gear is made of cast steel, and it is very massive and heavy. The amount of stock removed varies considerably, and requires a very rugged vertical-spindle attachment. The operation is performed with one 8 1/2-inch diameter inserted-blade face mill and one 5-inch diameter shell end-mill, together with two centering drills. The feed is 4 1/4 inches per minute. The time per piece is 4.1 minutes.

An outstanding fact that should be noted is that no time is lost during the operation. While the piece is being milled at one end, the operator center-drills the other end, which has been finished previously, and reloads the fixture. When the milling is completed, he indexes the base and the next piece is machined in the same way, so that the operation is practically continuous.

A subsequent operation, illustrated in Fig. 4, is the milling of the V-grooves. No standard index-head would carry this heavy casting and hold it securely under the pressure of the cut; therefore an especially heavy index-head was designed for the job. The piece is mounted on centers and located by adjustable stops on the faceplate. Only three turns of the index handle are required to rotate the piece 180 degrees. The headstock and footstock are mounted on a taper plate to obtain the required degree of taper in the vee. On this operation 3/16 inch of stock is removed by a special gang of four inserted-blade mills, the largest diameter of which is 8 1/2 inches. The feed is 4 1/4 inches per minute, and the speed is 20 revolutions per minute, making it possible to turn one piece out in only 11 minutes.

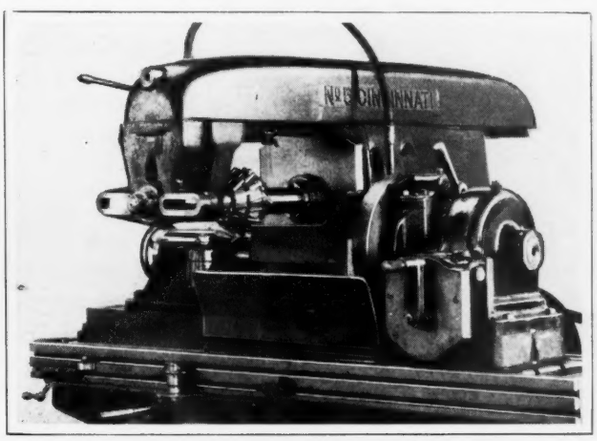


Fig. 4. V-grooving the Friction Draft Gear

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FIFTIETH ANNIVERSARY OF THE A. S. M. E.

The American Society of Mechanical Engineers was founded in 1880, and the fiftieth anniversary of the society will be celebrated during the week beginning April 7, 1930. This date marks the anniversary of the organization meeting of the society which was held at Stevens Institute of Technology.

While plans for the proposed celebration have not been entirely completed, the tentative arrangement provides concurrently for an international engineering congress of outstanding nature, which will not only mark the achievements of the engineering profession during the last fifty years, but will point the way for future growth and development. It is expected that this fiftieth anniversary meeting will be held in Washington, D. C., thus giving it a national and international character.

* * *

ANNUAL MEETING OF AMERICAN INSTITUTE OF WEIGHTS AND MEASURES

The annual meeting of the American Institute of Weights and Measures, 115 Broadway, New York City, was held in the rooms of the institute, Thursday, December 8. Among matters of technical interest brought before the meeting was a discussion of procedure to secure a unanimous recommendation from American industry of a new and more convenient name for "one thousandth of an inch" as a unit of measurement. The adoption of a small unit of volume measurement and of weight was discussed.

Steel Wool and Its Manufacture*

By CROSBY FIELD, Vice-president, Brillo Mfg. Co., Brooklyn, N. Y.

STEEL wool consists of long, silky fibers shaved from steel. A mass of such fibers, particularly when felted or padded, bears a striking resemblance to wool, whence its name, although the method of manufacture and the fact that it has a counterpart in the wood industry tend to make the infrequently used term "steel shaving" nearly correct etymologically.

Steel wool consists, therefore, of long, relatively strong, and resilient steel shavings, of polygonal cross-section, usually triangular, but always possessing three or more sharp edges. This characteristic renders it an excellent abrasive and a strong competitor of sandpaper and similar abrasives in the woodworking industries. The fact that its cutting characteristics vary with the size of the fiber, which is readily controlled in manufacture, has enabled it to find special markets where its supremacy is unchallenged, such as the household, particularly for rapid cleaning of aluminum and other cooking utensils. The coarser grades are used to a large degree by painters for the preparation of surfaces to be painted.

Metals other than steel have been made into wool by the same processes as steel, and when so manufactured have the same general characteristics. Thus wool has been made from copper, lead, aluminum, bronze, brass, monel metal, and nickel. Metal wool, or metal shavings, must, however, be distinguished from other metal products, such as those manufactured by flattening wire into ribbons, as, for example, tinsel, etc., which lack sharp cutting edges. Metal wool must also be distinguished from short chips, such as are obtained from ordinary machine shop tools. True metal-wool fibers are quite long, usually several feet each. In the coarser grades, individual fibers have been made over 100,000 feet long.

The steel wool industry originated in Germany, where the coarser grades were manufactured for scraping wood floors. It is now centered in the United States, where eight companies manufacture approximately 3000 tons a year. Of this amount nearly 90 per cent is manufactured by three firms, who have improved their respective processes of manufacture and their products beyond the present ability of the German industry. More than half of the steel wool production of the world is consumed by the American housewife. Steel wool is manufactured in nine regular grades.

Properties of Wire Used

The wire from which steel wool is made may be produced by either the Bessemer, or the basic or acid open-hearth processes. It should contain from 0.10 to 0.20 per cent carbon; from 0.50 to 1.00 per cent manganese; from 0.020 to 0.090 per cent sulphur; from 0.050 to 0.120 per cent phosphorus; and from 0.001 to 0.010 per cent silicon. When drawn on a standard tensile-strength testing machine, a sample of the steel should show an ultimate strength of not less than 120,000 pounds per square inch.

About 40 per cent of the United States production of steel wool is made on the Brillo-Field automatic machine, and the remainder on the original shaving-block type of machine, some modifications of which have been developed to a point of considerable efficiency. All these machines use wire as raw material. Although numerous attempts to use material other than wire have been made, no plant is at present in commercial production in the United States that does not manufacture from wire.

Principle of the Shaving-block Machine

Until last year the shaving-block machine, with many modifications, was the standard commercial type used in the United States. All these machines dragged a single wire over a guiding block or blocks, on which a hand-adjusted cutting tool bore. Some machines had six knives, some eight, some as many as fifteen. Some machines were extremely light, others very heavy; some had traversing knives, others swinging, others oscillating. All used the same type of knife, having a serrated edge, but the number of serrations to the inch, the profile of the cutting tooth, etc., were trade secrets. The simplest, and possibly earliest, machine embodying all essentials of the shaving-block machine was patented in Switzerland in 1901.

The most ambitious refinement of the shaving-block type machine was introduced by Steinbart in 1924, which has for its aim the consumption of the usable portion of the wire in a single pass of the wire through the machine. This machine consists of a multiplicity of parallel shaving blocks, all attached to a single supporting frame, over which multiple strands of the same wire are dragged. These strands are separated from each other about 1 1/2 inches, and each knife cuts upon only one strand of wire, thus varying the usual procedure with repassing wire machines where the wire strands are run close enough together so that the same knife can cut several wires simultaneously. The wire is passed and repassed about fifty-six times; consequently, the idler rollers of the fewer number of passes have become large drums, about 4 feet in diameter by 7 feet long. Both drums are power-driven and intergeared so as to travel at the same peripheral speed. There are 574 individual cutting tools or knives, placed half on each side of the machine.

Features of the Brillo-Field Process

In a Brillo-Field machine up to twenty strands of wire are cut simultaneously by one knife. The

*Abstract of a paper read before the annual meeting of the American Society of Mechanical Engineers, New York City, December 5 to 8, 1927.

wire does not move through a track; instead it is held in a loop around a wheel, so that it is to all practical purposes an integral part of the wheel. A complete Brillo-Field machine consists of a number of wheels in tandem, together with means for supplying the wheels with wire to be cut and taking from the wheels the metal wool and the scrap wire. Under present conditions of steel wool manufacture, a continuous unit of five or six wheels is preferable.

Both single-unit and multi-unit plants are controlled in so far as starting, stopping, speed, and wire-tension control are concerned, from a central switchboard, and once started, the control is entirely automatic until the operation is interrupted by a flaw in the material or the using up of the wire on the feed drum. The wire coming from the feed drum is wrapped several times about the grooved wheel and grooved transfer rollers, and then is wound up on another drum.

Cutting is accomplished by means of serrated knives, there being a different number of serrations, a different profile of serration, a different steel, a different heat-treatment, and a different cutting angle and land for each of the nine usual sizes of fiber (usually called grades of wool) on the market. Chattering of the knives is prevented by the combination of the inertia effect of the heavy weight system and the frictional dampening effect of an extra large tool-holder shaft and split bushing. The latter effect is accentuated by the use of dampening fluids for lubrication of this surface. In practice, there is no chatter, the tool-holder accommodating the knife-edge simultaneously to the several strands of wire. This involves a constant thought slight floating movement of the tool-holder, for no wheel can be maintained round to the degree of accuracy required, and the thickness of the wire is subject to change at any place as knives are replaced ahead of it.

Another characteristic of this tool-holder is that, upon the knife striking a hard spot in the wire, due to segregation, slag, or other cause, the knife will "jump" out of cutting relation to the wire, permitting this hard spot to continue its travel until it encounters a knife specially designed to remove it, after which the rest of the serrated knives on the train function normally.

An air-blast system and lubricating boxes for cutting oil are incorporated in the machine. There are also hoods, rake conveyors for removing the wool, and suction hoods for removing the oil smoke. [Readers of MACHINERY especially interested in the manufacture of steel wool, may obtain comprehensive information on the subject by writing to the American Society of Mechanical Engineers, 29 W. 39th St., New York City, and asking for a copy of the paper here abstracted—EDITOR]

* * *

The Taylor Society, 29 W. 39th St., New York City, met in New York, December 8 to 10. Among the papers presented was one on "Social and Economic Surveys," by E. E. Hunt of the Department of Commerce, Washington, D. C., and another on "High Wages and Prosperity," by Henry H. Williams, general manager of the R. T. French Co., Philadelphia, Pa.

ANNUAL MEETING OF THE A. S. M. E.

The annual meeting of the American Society of Mechanical Engineers was held at the Engineering Societies Building, 29 W. 39th St., New York City, December 5 to 9. A comprehensive program had been prepared covering almost every phase of mechanical engineering. The Machine Shop Practice Division held three different sessions at which papers of unusual value were read.

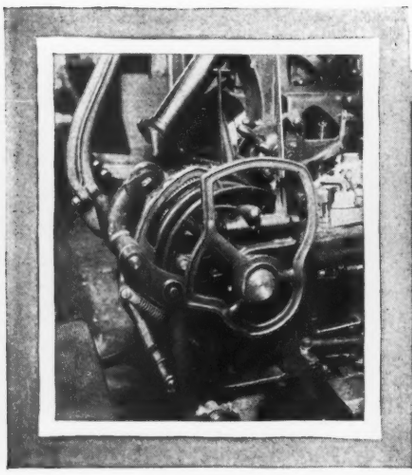
One session was devoted to a symposium on shop equipment maintenance, at which five engineers from five different manufacturing organizations covered the subject of shop equipment maintenance in an exhaustive manner. Four of the papers described the organization of shop equipment maintenance departments. The companies whose practice was described were the General Electric Co., the Westinghouse Electric & Mfg. Co., the National Cash Register Co., and the Hess-Bright Mfg. Co. One paper in the symposium was more directly related to the fundamental economics of the question of plant maintenance.

Another complete session was given over to the subject of hydraulic feeds and drives for machine tools. Four papers were presented in this symposium, as follows: "Hydraulic Feed in Mechanism for Milling Machines," by S. Einstein, chief engineer, and H. Ernst, research engineer, Cincinnati Milling Machine Co.; "Characteristics of Hydraulic Feed and Drive for Cutting Tools," by Walter Ferris, vice-president and chief engineer, The Oilgear Co.; "The Development of Hydraulic Feeds on Multiple Drilling Machines," by R. M. Galloway, National Automatic Tool Co.; and "Hydraulics and Modern Machine Tool Design," by Waldo J. Guild, chief engineer, Heald Machine Co.

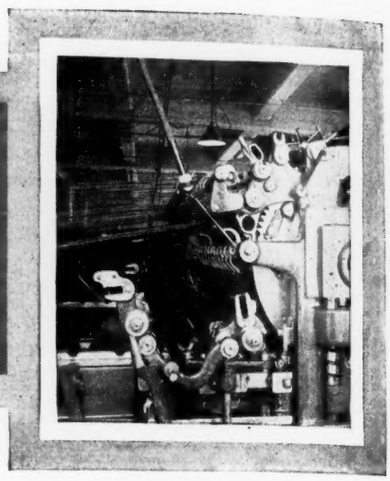
Another interesting paper devoted to machine shop practice was presented by F. C. Spencer, assistant superintendent of manufacturing development, Western Electric Co., under the title of "The Development of Machine Tools from a User's Viewpoint." Five important considerations affecting the selection of machine tools were mentioned, namely, minimum floor space, elimination of accident hazards by properly designed guards, reduction of physical effort by convenient operating arrangements, cleanliness, and appearance. This paper also discussed the possibilities of the hydraulic drive. L. C. Morrow, managing editor of the *American Machinist* and chairman of the Machine Shop Practice Division, presented a report on "Progress in Machine Shop Practice."

One session was given over to the subject of apprentice training. C. J. Freund, apprentice supervisor of the Falk Corporation, read a paper on "Apprentice Training for Draftsmen." Ben. S. Moffatt, supervisor of apprentice training, Caterpillar Tractor Co., outlined in a paper entitled "Principles of Apprenticeship Organization," the cost of training, methods of shop supervision, and classroom instruction in technical subjects.

The presidential address of Charles M. Schwab on "Human Engineering," points the way toward a new conception of the duties and responsibilities of the management of business enterprises. Coming from a man so eminently successful in industry as Mr. Schwab, it will take its place among the important records of our industrial era.



Ingenious Mechanical Movements



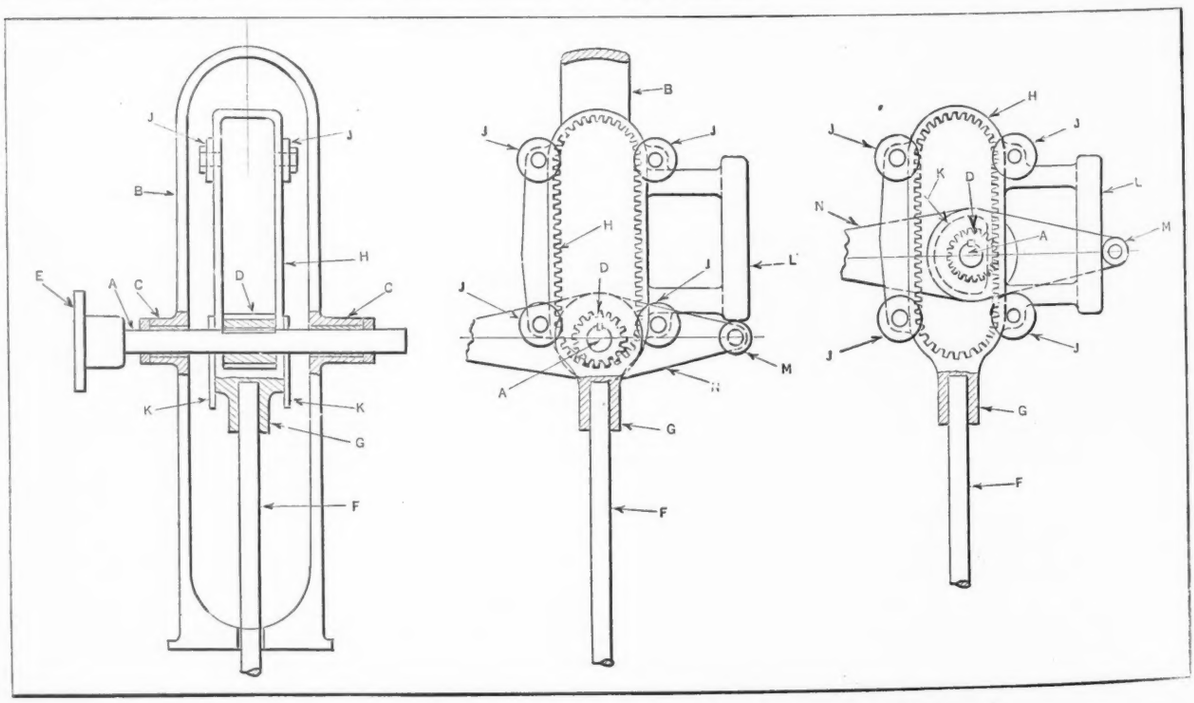
LONG-STROKE MECHANISM FOR WINDMILL PUMP

By DOUGLAS P. MUIRHEAD

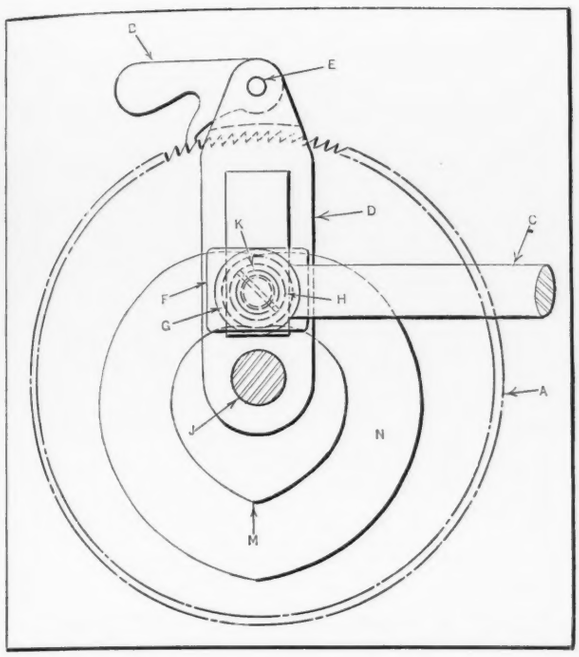
An ingenious mechanism was used in the head of a windmill about twenty years ago in order to obtain a long stroke for the pump rod and still allow the wind wheel to run at an efficient speed. In the accompanying illustration, a vertical section through the gearing is shown at the left, a front view in the center, and a front view at approximately midstroke at the right. In these different views, each part referred to is indicated by the same reference letter.

The main shaft *A* is supported in the main bearings *C* (left-hand view) which are held in housings in the head casting *B* of the mill head. The actual wind wheel is connected to the shaft at *E*, a coupling only being shown. On the main shaft is keyed a pinion *D* which meshes with an internal rack *H*. This rack consists of two vertical sections which the pinion *D* engages alternately, and connecting semicircular sections at top and bottom. The rack is provided with four steel rollers *J*, which engage with the cam *K* at the bottom and top of the pump stroke. These cams throw over the rack at the end of each stroke and thus reverse the direction of travel of the pump rod *F*, which is shown connected to the bottom of the rack at *G*. An extension of the rack at *L* consists of a steel guide plate which is in contact with a flanged roller *M*, and this keeps the pinion *D* in mesh with the rack *H*. This is clearly illustrated in the right-hand view, which shows the pump at approximately midstroke. The roller *M* is shown in the central view, passing across the bottom portion of the guide plate; it will make contact next with the inside face of the guide plate, and thus keep the pinion *D* in mesh with the opposite side of the rack *H*. The swing of the rack is only about 1 3/4 inches; consequently there is very little angular motion of the pump connecting-rod.

The gearing shown gave one stroke of the pump, which was double-acting, to two and a half revolutions of the wheel. On account of the slow motion of the gear, the wear of the working parts was reduced to a minimum, and the mechanism as a unit was efficient.



Windmill Pump Drive for Obtaining Long Stroke and Efficient Windmill Speed



Ratchet Feed Movement which is Increased and Decreased Alternately as Cam Varies Radial Position of Crankpin

AUTOMATIC VARIATION IN RATCHET FEED MOTION

By J. E. FENNO

A special attachment on a wood-turning machine requires a comparatively heavy feed at the beginning, followed by a finer feed for finishing. This alternate retarding and accelerating feed motion is obtained automatically from a ratchet mechanism (see illustration) which is so designed that the radial position of the ratchet lever crankpin is continuously increased and decreased by a cam. The ratchet wheel *A* is secured to the feed-screw shaft and the cam groove *N* is cut in one side. Ratchet lever *D* is free to turn on shaft *J*, and it carries the feed pawl *B*. Lever *D* is given a swinging or oscillating movement by link *C* which connects with stud *K*. This stud is driven into the slide or cross-head *F*, and it has a projection on the other side carrying the cam roll *G* which engages cam groove *N*.

It is evident that as ratchet *A* is intermittently rotated, the cam will first increase the radial position of pin *K* until point *M* is passed, and then will return pin *K* to the minimum radial position shown by the illustration. This increase and decrease between the centers of shaft *J* and pin *K* will, of course, have a corresponding effect upon the arc through which lever *D* swings and the resulting movement imparted to ratchet wheel *A* and the feed-screw.

* * *

SELF-CLAMPING ROTARY MILLING VISE

By DONALD A. HAMPSON

A large number of small caps or butt pieces, such as shown at *A*, Fig. 1, were required to be slotted across the ends. The milling vise or fixture made to handle this work is shown in Figs. 1 and 2. The caps to be slotted are made from 1/4-inch round stock, and are drilled and threaded at one end in a screw machine, and cut off to a length of 1/2 inch. The slots are cut to a depth of 1/8 inch with a slitting saw 1/32 inch wide as the pieces are carried past the saw *W*, Fig. 2, by the rotating vise jaws *D* and *E*.

The fixture is mounted on the table of a milling machine with the axis of the shaft *G* parallel with the spindle of the machine but at a fixed distance below it. Shaft *G* drives the two disks *D* and *E* between which the small caps or pieces of work are gripped. In effect, the rotating disks *D* and *E* become vise jaws, which hold the caps securely while they are being slotted. With this arrangement, the slots are cut while the pieces are at the highest point of rotation.

Rotation is accomplished by a belt drive from the countershaft to a pulley *P*, Fig. 1, which is mounted on the projecting end of shaft *G*. The spindle of the milling machine on which the cutter *W*, Fig. 2, is mounted, and the shaft *G* with its various assembled members are the only moving parts, the milling table being locked in a fixed position.

There are three major members between the bearings of shaft *G*. These are the cast-iron carrier *C*, which has three lugs spaced 120 degrees apart carrying studs *S* with rollers *R;* the floating vise jaw or disk *D;* and a jaw *E* which is secured to the shaft by a taper pin. A plain ball thrust bearing *T* takes the thrust exerted by the clamping action of the loose jaw *D*. A screw *H* having a dog point which seats in the hub of carrier *C* prevents the latter member from revolving, and provides means for exerting sufficient pressure to clamp the work.

The carrier *C* has two axes, namely, that of the reamed hole in which the shaft turns and that on which the studs *S* are laid out, which is in a plane normal to line *X-Y*. Members *C* and *H* do not revolve, but the members *D*, *E*, and *T* revolve when shaft *G* is rotated. Jaw *D* is bored out much larger than the shaft, and has a groove turned in its periphery for the work pieces *A*.

The dimensions of the pieces are such that they fill the groove, both with respect to the width and diameter. Thus the clamping jaw or disk *D* is made to revolve upon the axis *X-Y* and also float in relation to the main shaft. Accordingly, there is always a clearance or space between members *D* and *E* at the bottom while they are in contact

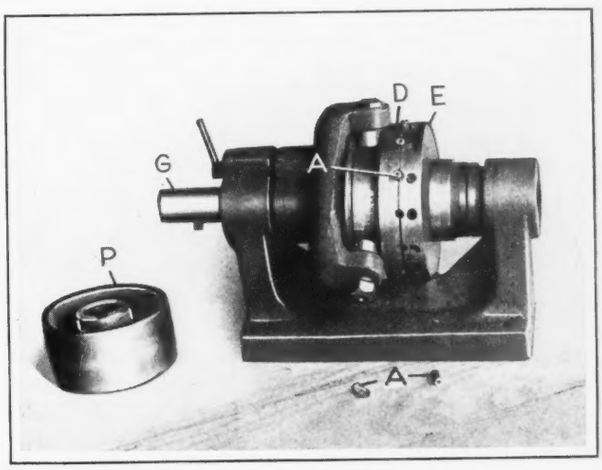


Fig. 1. Continuous-feed Vise for Slotting Small Pieces

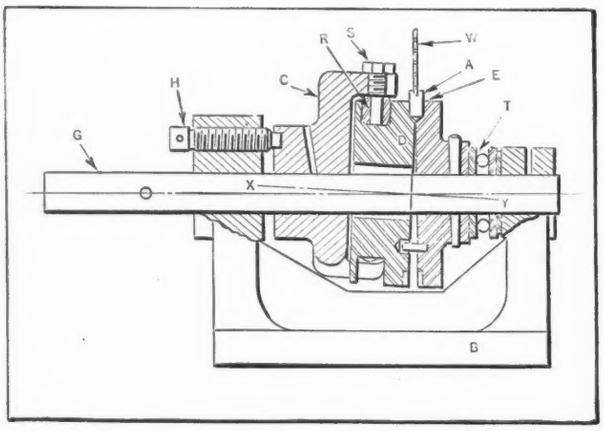


Fig. 2. Cross-section of Milling Vise Shown in Fig. 1

at the top. This makes it possible to load or place the pieces between the disk jaws, as shown at *A*, Fig. 1, on one side and have the work clamped securely in place when it rotates past the slitting cutter. The slotted pieces will be freed when they reach the side opposite the loading position where a knife blade, not shown, extracts any pieces that may drop out of their own accord.

Ordinarily, the work pieces cause member *D* to revolve with member *E*, but in order to maintain proper alignment of these two parts a pin is driven into member *E* which extends into a hole drilled in the face of member *D*, the hole in the latter member being a very loose fit for the pin. When work is held between the disks, the disks do not make actual contact, as they are faced off to provide sufficient clearance for the required clamping movement. This facing operation is performed after the holes for the work have been drilled in the disks.

In building the vise, the countersunk spots, as shown in Fig. 1, are made in the periphery of member *E*, using an ordinary indexing head to obtain accurate spacing. These spot holes are afterward employed for indexing purposes in drilling the holes in the work. The required pressure between the disk jaws is obtained by adjusting the screw *H*. After once being adjusted, however, this screw seldom requires attention.

* * *

CAM-OPERATED EQUALIZING CLAMPS

By ROWLAND L. HILL

The equalizing clamping mechanism shown in part by the accompanying illustration may be applied to jigs or fixtures for forcing together two opposed clamps located on opposite sides of the work. Shaft *D* extends through the jig or fixture and has a face-cam *A* on each end. Both cams are operated by hand lever *F*. One clamp is located at the end of shaft *G*, and the opposed clamp has a similar shaft, not illustrated, which bears against the cam at the opposite end of shaft *D*. These two shafts *G* are forced inward by their respective cams for clamping the work, and when the cams are turned in the opposite direction to release the clamps, shafts *G* are moved backward by springs. The spring for the shaft illustrated is shown at *J*. This spring bears against a pin *H* which passes through a slot in the shaft *G*, and thus prevents the shaft from turning.

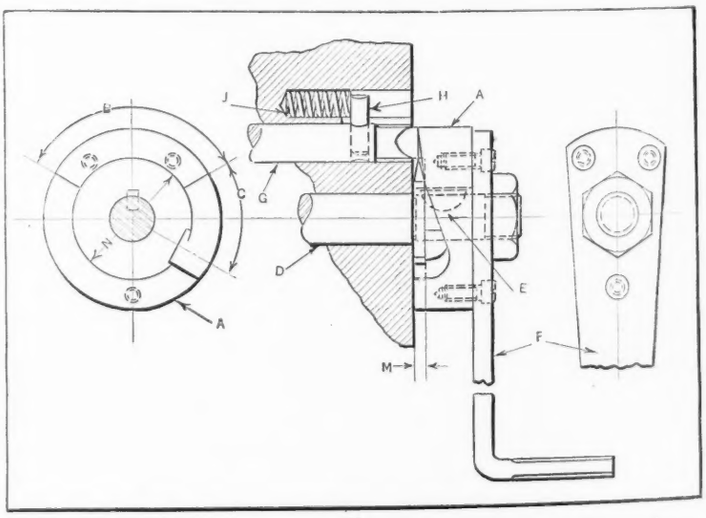
With this arrangement, the two clamps, which may be in the form of V-blocks, pins, or any required shape, are moved equally toward the work. The clamps are released by pulling up lever *F*, thus allowing springs *J* to force the clamps back. The ends of shafts *G* which ride on the cams, should be tapered on each side. The face-cam is recessed as indicated by diameter *N* and depth *M*. The rise of part *B* of the cam face should be about 1/4 inch in 120 degrees, and part *C* should have a rise of 3/8 to 5/8 inch in 60 degrees. The proportions of the various parts will, of course, depend upon the size of the fixture and the nature of the work. This has proved to be an economical and successful clamping arrangement.

* * *

CAUTION IN PLACING FOREIGN ORDERS

A manufacturer informs us that he recently placed a small trial order for some patented tools sold by a European concern about whom he had no information and with whom he had no former dealings. The order was placed with a representative of the firm, traveling in this country. When the order was received abroad, the small trial order placed was interpreted to mean a very large order, and a great quantity of tools were shipped and the American firm billed for them. The manufacturer states that he believes that the form of the order blank is intentionally so designed that it is capable of misinterpretation, and that an attempt is made in this way to force American manufacturers to accept much larger quantities than they intended to buy.

Similar complaints relating to placing of trial orders for steel with European manufacturers, not generally known here, have come from Canada. American manufacturers, therefore, might well be on their guard in placing orders for trial shipments with firms abroad that are unknown to them; perhaps the use of their own order blanks might be advisable.



One End of a Double-cam Mechanism for Operating Opposed Equalizing Clamps

Notes and Comment on Engineering Topics

Gold wire drawn so fine that 3500 yards weigh only one ounce was shown at a recent exhibition in England.

In 1900 there were 8000 automobiles registered in the United States. Now the registration has reached over 22,000,000. Assuming that the life of a car is about eight years, the replacement market alone each year would amount to 2,750,000 cars and trucks.

According to a report by the Department of Manufacture of the Chamber of Commerce of the United States, there are now over 1,350,000 workers in this country employed under the representation plan.

Although steel production in the United States fell off substantially in 1927 as compared with 1926, the world's output of steel during the year just ended was about 10 per cent above 1926. The total output of the world's steel production in 1927 was approximately 85,000,000 tons, exceeding that of 1913 by over 30 per cent. This large gain, which was due to the production of European steel plants, may be taken as evidence that the European steel industry has fully recovered from the effects of the war, and that the world consumption of steel is and will continue to be high.

The annual report of the Secretary of Commerce for the fiscal year ended July 1, 1927, which has just been published, contains a great deal of interest to those engaged in commerce and industry. Among the subjects of particular interest may be mentioned "Progress in National Efficiency," "Elimination of Waste," and "Increase of Standards of Living," each based upon a careful investigation and survey, and containing specific and definite information on the subjects covered. The complete report may be obtained by addressing the Department of Commerce, Washington, D. C.

As a result of extensive experiments, two Japanese engineers have come to the conclusion that in determining the hardness of metals by the Brinell method, the diameter of the impression made should be calculated from the depth of the impression measured while the ball producing the indentation is under load, instead of being measured directly after the load has been removed. There is no material difference in the results obtained by the two methods when applied to soft metals, but the differences are considerable when applied to metals having great elasticity, as for example, hardened steel, because the metal partly recovers its original shape when the load is removed. It has been shown that if the hardness numbers are determined by measuring the depth of the impression while the load is applied, they bear a much simpler relation to the hardness numbers obtained by other hardness testing apparatus based on different principles.

Metal railroad ties, constructed by electric arc welding from worn rails, can be made at a much lower cost and ten times stronger than the ordinary wooden type tie, according to William Dalton of the general manufacturing department of the General Electric Co. Mr. Dalton recently completed a test extending over a period of a year, in collaboration with H. S. Clark, engineer, maintenance of way, Delaware & Hudson Railroad. Two lengths of worn rail are fastened together at each end by metal plates welded in position to form the tie. For fastening the track to the tie, metal plates are welded to the tie and the track clamped to these with special clamping devices which cannot slip out of place.

An analysis of costs of wooden versus metal ties shows a total cost of $2.80 for the wooden variety. Fabricating the metal tie designed by Mr. Dalton costs 60 cents. The scrap value of the rail in the tie is $2.50, but this value can be realized when it is later discarded from tie service. The Delaware & Hudson Railroad has decided to undertake the substitution of metal for wooden ties in yards and sidings.

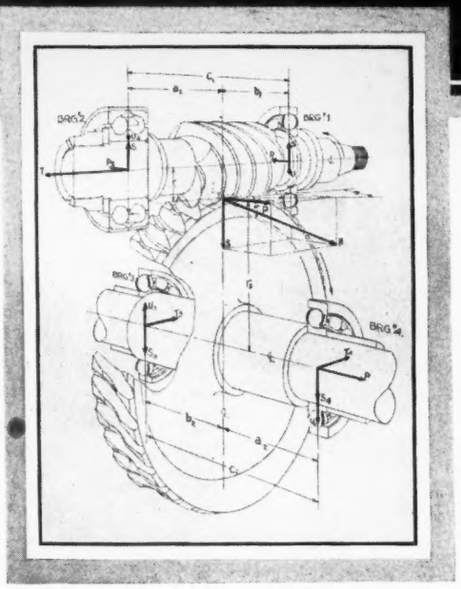
THE GROWTH OF AVIATION

In a statement on aviation prepared by Walter T. Varney, an operator of the Salt Lake City-Pasco Airlines, it is emphasized that the real test of aviation does not rest on adventurous flying achievements, heroic though they may be. "Aviation," says Mr. Varney, "does not stand upon a record of stunts, even though those stunts proved successful. It bases its claim for recognition on a record of service reliably performed.

"The aeronautic branch of the Department of Commerce reports that during the first six months of this year, commercial planes flew 12,377,933 miles and carried 395,646 passengers. The records of privately owned and operated planes, or of those used for testing purposes or engaged in contests, are not included in this total.

"Planes engaged in the air mail service are daily covering 16,000 miles, of which approximately 3500 miles are flown at night. The night service is steadily being increased as the Government is establishing beacons throughout the country. The American air mail service is the envy of all the world. No other nation comes near to equaling its record. It is recognized, in fact, as the outstanding achievement of aviation. The air mail service has given aviation its real test. It has proved the reliability of American built motors and established the reliability of the airplane as a means of transportation."

Principles of Perspective Drawing



By PERRY N. DEMING
Engineering Department, New Departure Mfg. Co., Bristol, Conn.

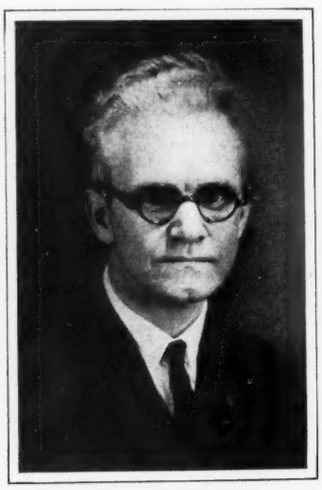
THE purpose of this article is to indicate, in a few words, and largely by diagrams and examples, the extreme simplicity and usefulness of perspective drawing, to patent draftsmen, display and advertising draftsmen, and draftsmen generally.

Referring to Fig. 1, it is evident that if, in the isosceles triangles *AEZ* and *DEH*, we draw lines 1-5 or 4-6 parallel to the base lines *AZ* or *DH*, the distances 1-2 or 3-4 cut off on *ZE* or *EH* will be equal to the distances 5-7 or 8-6. Furthermore, if we continue the lines 1-5, 2-7 and 4-6, 3-8 parallel to *ED* and *AE*, respectively, we will produce a rectangle, as indicated at *X*.

Now it is well known that all parallel lines converge, in perspective, to a point. So in Fig. 2, to get the rectangle *X* in perspective, instead of drawing lines from 1 and 2 etc., parallel to one another, we draw both of them toward a point *C* (which is a distance equal to *AE* from *A*) until they cut *AE* at 5 and 7, and then continue them toward *D*.

Similarly, we draw lines from 3 and 4 toward *B* (which is a distance equal to *DE* from *D*) and then continue them toward *A*. It will be understood that *AD* is parallel to 1-4 and that *EI* is perpendicular to and bisects *AD*. Again, we have the same rectangle *X*, but drawn in perspective. Every perspective problem is based on this procedure.

In practical work, a large board, as shown in Fig. 3, is best, though a small board with arms, as shown in Fig. 4, is satisfactory. The point is to keep *A* and *D* a long distance apart, yet still within the reach of a straightedge. The writer uses stiff 3/4-inch wires driven into the board at *A*, *B*, *C*, and *D* to rest the straightedge against while projecting points or drawing lines. This makes for speed and accuracy.



PERRY N. DEMING was born in Winsted, Conn. He started work when he was fourteeen years old, after one year in high school, but continued to study nights, taking courses in mechanical drawing and ornamental design with the Y.M.C.A. and the I.C.S. In 1917, he graduated from Pratt Institute in Brooklyn, after which he served in the army for two years, spending fourteen months in France and Germany with the Ordnance Corps. Mr. Deming has been employed as a draftsman for the Erskine Danforth Co. in Stamford, Conn., and during the last nine years he has been with the New Departure Mfg. Co., Bristol, Conn., in different departments, including the General Motor Corporation's patent department. He is president of the Pratt Club of Connecticut.

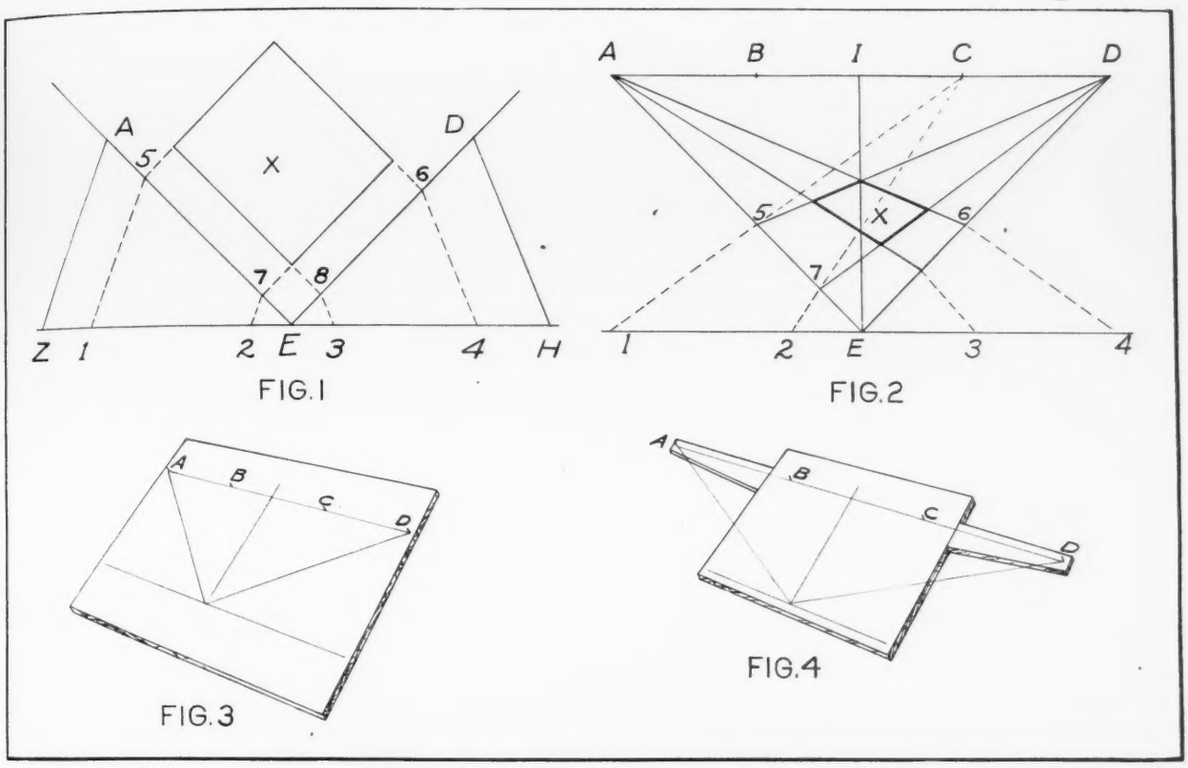
Steps in Making Perspective Drawing of a Block

Now for a practical problem; we propose to draw, in perspective, a simple block 3 inches by 2 inches by 1 inch. Referring to Fig. 5, *AD* is parallel to 1-4, *AC* equals *AE*, *DB* equals *DE*, and *EI* is perpendicular to and bisects *AD*.

First we scale off 2 inches (the width of the block) between points 1 and 2, point 2 being any distance from *E* which experience shows will bring the perspective figure in the desired location. Lines from points 1 and 2 are projected toward *C* until they meet *AE*, and are then continued toward *D*. The points 3 and 4, which are 3 inches apart (the length of the block), are located anywhere on the base line; lines from 3 and 4 are projected toward *B* to meet *ED* and then continued toward *A*. The intersections form the base *X* of our block.

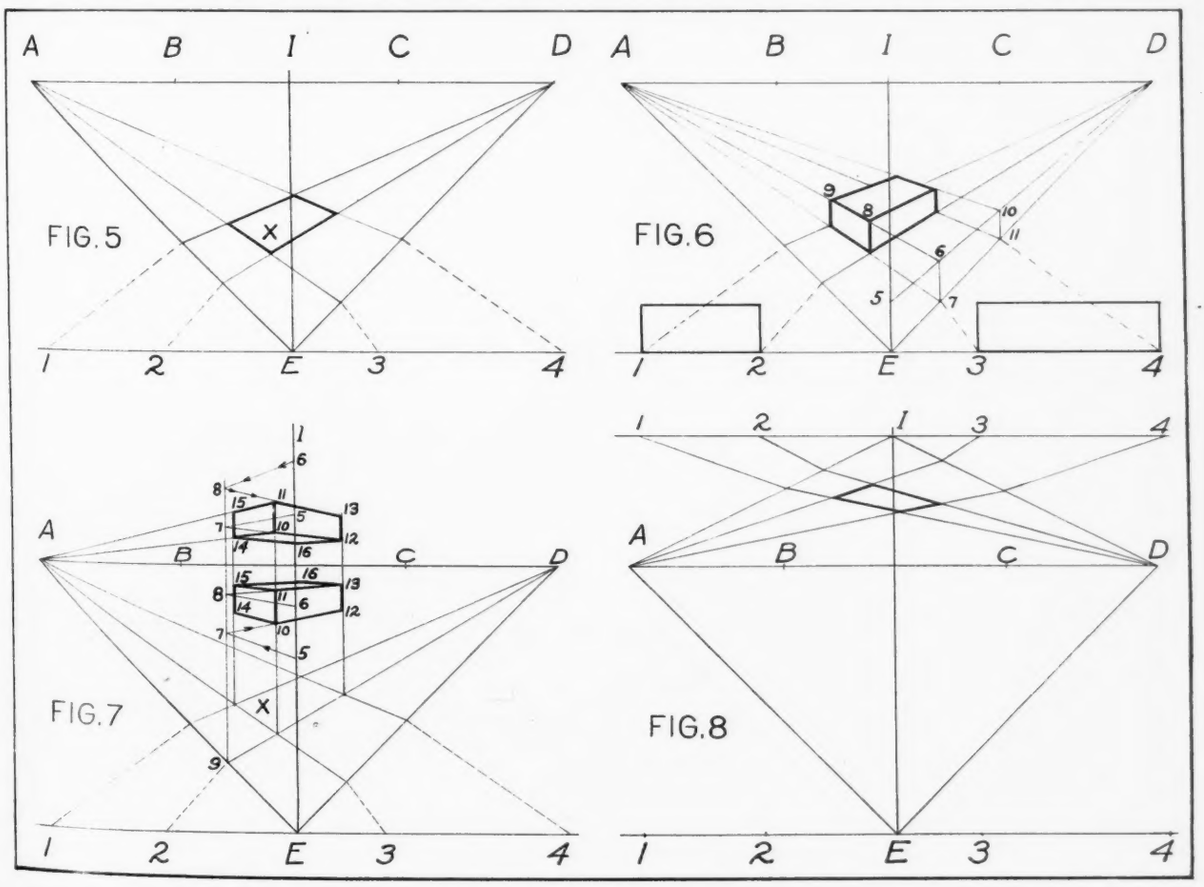
Actual widths and lengths of objects are always laid off on the base line 1-4, one dimension at one side, and the other dimension at the other side, of the point *E*. Actual heights of objects are laid off on *E-I*.

Referring to Fig. 6, the height (1 inch) of our block is laid off on *E-I* from *E* to a point 5, and then projected toward *D* until it meets, at 6, a perpendicular erected at the point 7. Then a line is drawn from 6 toward *A* until it cuts, at 8 and 9, perpendiculars erected at the front corners of the base. This completes the left front face of the block in perspective. To obtain the long, 3-inch top edges, lines are drawn from 8 and 9 toward *D* until they intersect the line 10-*A*, point 10 being the intersection with line 5-*D* of a perpendicular erected at 11. The block is now completely drawn in perspective. Its position and its size can be controlled, within limits, by a choice in the location of distances 1-2 and 3-4 on the base line.



Figs. 1 and 2. Isometric and Perspective Projections of Rectangular Surface. Fig. 3. Large Board with Locating Pins for Perspective Drawing. Fig. 4. Small Drawing-board with Arms for Locating Pins

Frequently, we do not desire to draw the figure as far below the eye as in Fig. 6. Fig. 7 shows how to place it a smaller distance below or above the eye. From the corners of the base *X*, perpendiculars are drawn which will include the vertical corners of the new figures. The height (1 inch) of the block is laid off anywhere on *EI*, as from 5 to 6. Lines are drawn from 5 and 6 toward *A* until they meet, at 7 and 8, a perpendicular at 9. Lines drawn toward *D* from 7 and 8 intersect the per-



Figs. 5 to 8. Methods of Making Perspective Drawing of Block

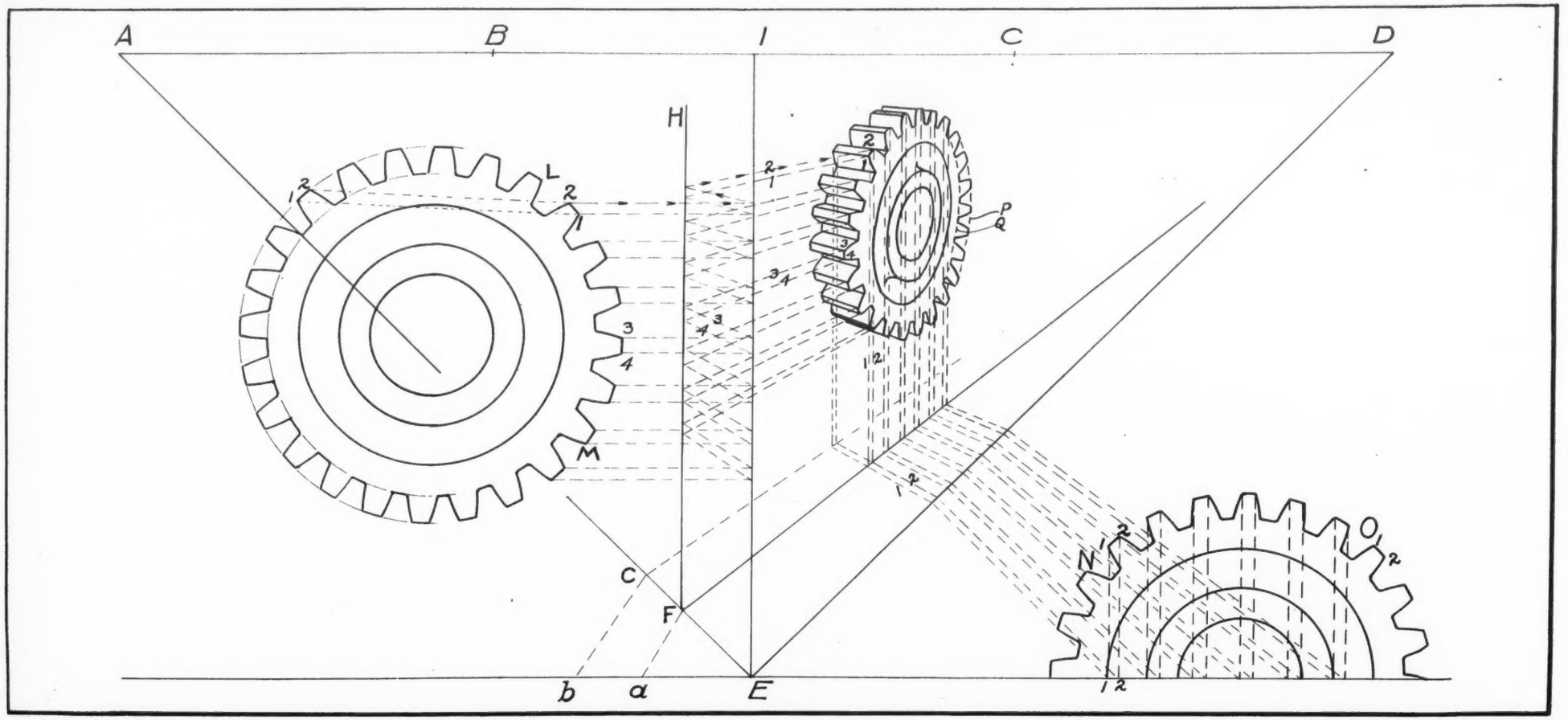


Fig. 9. Diagram Illustrating how the Perspective View of a Gear is Drawn

pendiculars from the base *X* at 10, 11, 12, and 13, and complete the long 1-inch by 3-inch face of the block. To complete the left front face, draw lines 10-14 and 11-15 toward *A*. To complete the upper (or lower) face draw 15-16 (or 14-16) toward *D* and 13-16 (or 12-16) toward *A*. The figure may be placed above or below the line *AD*, and the procedure is the same as indicated.

Referring to Fig. 8, measurements may be laid off on a horizontal line 1-4 above *AD*, but the procedure is the same: First, project toward *B* or *C* and then toward *A* or *D*. We simply see the under side of the perspective figure instead of the top. This may be useful as a supplementary base from which to project points when there are a large number of lines on the lower base.

Drawing Circles in Perspective

In mechanical work many circles must be drawn in perspective, and this is conveniently done by projecting a hexagon or square which is inscribed in the circle, as shown in Fig. 11. The hexagon at the right has points 4, 5, 6 or 7, 8, 9 longitudinally spaced like the three points 1, 2, 3 on the base, and these points can be transferred to any line *DF* drawn from point *D*, merely by following the procedure previously given, line *FD* representing the plane in which the circle lies as located by point *H*.

By erecting perpendiculars at these points, we can transfer the points 1, 2, 3 to any other level. The vertical distances 1-4, 2-5, 3-6, must be laid off on *EI*, and this can conveniently be done by

cedure is the same. First, project toward B or C in the circle, as shown in Fig. 11. The hexagon at on on *E7*, and this can conveniently be done by

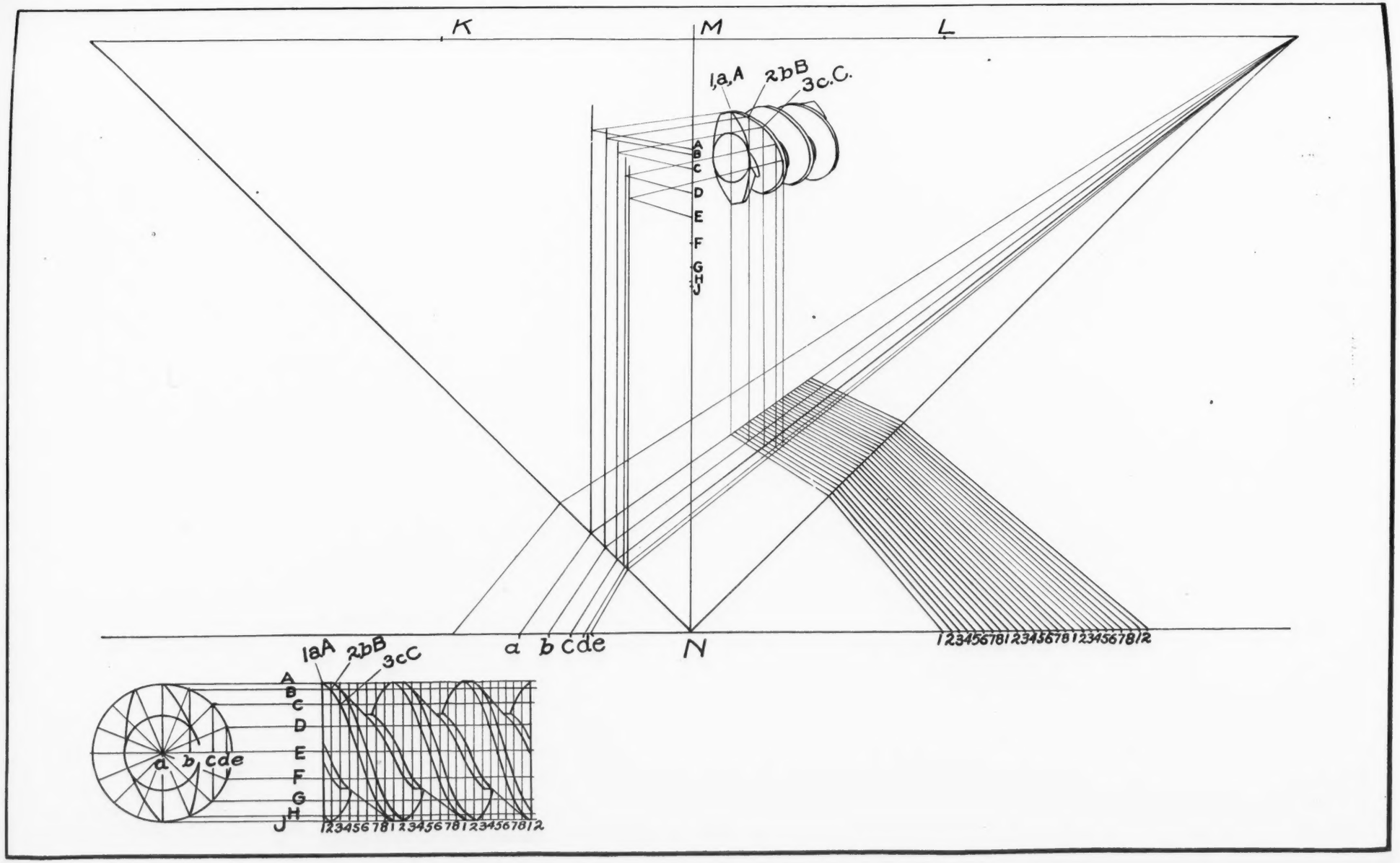


Fig. 10: Diagram Illustrating Method of Drawing a Worm Thread in Perspective

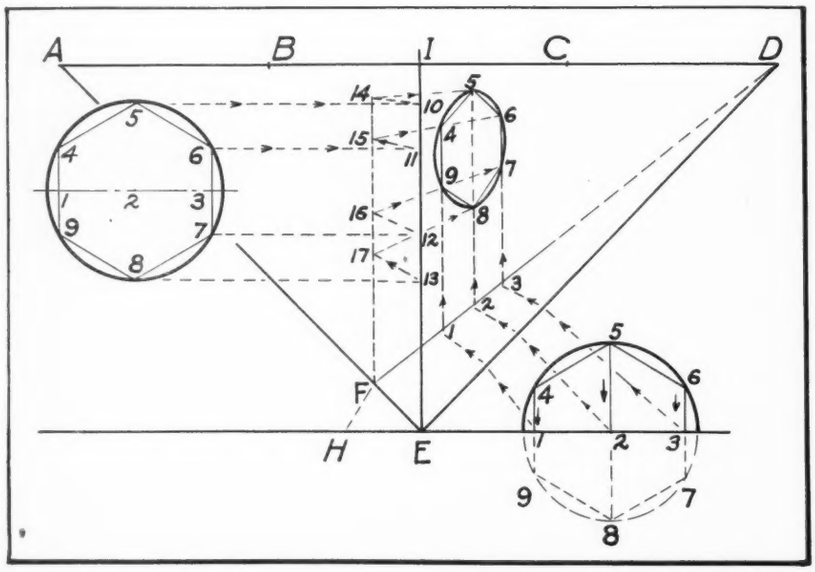


Fig. 11. Perspective View of Circle Circumscribed about Projected Hexagon

redrawing the circle and hexagon to the same scale at the left and projecting the points 4, 5, 6, 7, 8, 9 horizontally to *EI*, giving us points 10, 11, 12, 13. Projecting lines from these points 10, 11, 12, 13 toward *A* to the perpendicular at *F*, we get points 14, 15, 16, 17. Then projecting toward *D* to the intersections with the perpendiculars at 1, 2, 3, we locate the points 4, 5, 6, 7, 8, 9 of the perspective figure. The figure being symmetrical, only the right half, at the left, is needed and only the upper half of the figure at the right.

Fig. 13 is a similar figure, but to make the figure face to the left instead of to the right, we draw the hexagon circle to the left of *E-I*, point *H* locating the plane *AF* in which the figure is to lie. The circle from which the points 10, 11, 12, 13 are projected could, of course, be either on the right or left of *EI*, as it is used solely to obtain the vertical dimensions.

Locating a Perspective Figure Horizontally

Referring to Fig. 12, to locate a perspective figure horizontally, we can use two views, to the same scale, one turned 90 degrees from the other.

Note that here we are dealing, not with heights, but with lengths and widths, and these views are simply used as a convenient means to lay off these distances on the base line. It is only necessary to project each point, such as point 4, to the base line, and then project it in the right view toward *B* and *A*, and in the left view, toward *C* and *D* until the lines intersect to locate the primary points of the perspective figure. This is just the same, in effect, as laying off actual lengths and widths on the base line, as we did in Fig. 5.

In Fig. 14, the circle and hexagon are tipped at an angle of 30 degrees, and so we have three dimensions to deal with. The right-hand view is an inclined edge or line 5-8, and the left-hand view a hexagon circle, as indicated. From these two views, we proceed as in Fig. 12 to get intersections at which to erect vertical lines to include the new points of the perspective figure. The upper left hexagon and circle is then utilized just as in Fig. 13 to locate the heights of the various points. This procedure is just the same, in effect, as laying off actual lengths and widths on the base line and actual heights on the line *EI*, but by drawing the views, it is easier to keep track of corresponding points.

Drawing a Gear in Perspective

In Fig. 9, a gear is drawn in perspective. The first thing to do is to draw two circles *PQ* in perspective, to represent the circles through the roots and the tops of the teeth. They are drawn with the aid of an inscribed hexagon, as in Fig. 11, but the construction lines are removed from the completed figure to avoid confusion.

The next step in the procedure is to find, on these circles, points, as, for example, 1 and 2, which will locate the profiles of the gear teeth. We then draw the half gear at the right, as in this example the number of gear teeth is even, and project the points 1 and 2, in the usual way, to the circles already drawn.

The figure of the gear at the left is theoretically unnecessary, but is useful for two reasons. First, the corresponding points, as 1 and 2 on this figure, can be projected across to check the points previously located from the first figure. It will be found in practice that the teeth at the left of *N* and at the right of *O* involve the projection of points that approach the circles *P* and *Q* very much like a tangent, making it difficult to find the exact points of intersection. Hence we use the left-hand figure to locate points such as 3 and 4 for the teeth between *L* and *M*, because the projected points do not approach the circles tangentially. The line *ab*, of course, represents the thickness of the gear, and lines *bc* and *CD* locate the plane of the rear face of the gear.

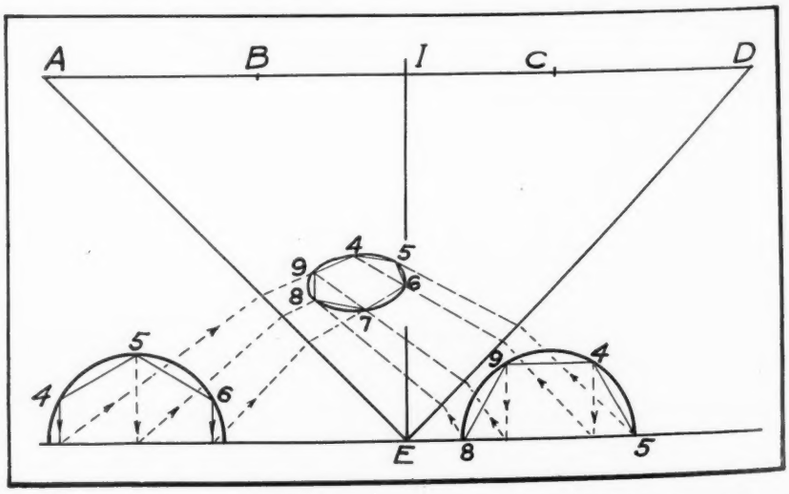


Fig. 12. Perspective of Hexagon and Circumscribed Circle in Horizontal Plane

Drawing a Perspective View of a Worm

Probably a worm is as hard to draw in perspective as any figure that will be met with, because of the difficulty of keeping track of the corresponding points and because it is necessary to use many of them. In the lower left-hand corner of Fig. 10 is an end view, and just to the right a side view of the work. We can cut the worm up into longitudinal sections by passing a series of vertical planes 1, 2, 3, 4, 5, etc., through it at right angles to its axis. The distances 1-2, 2-3, 3-4, etc., are lengths, and can be laid off on the base line as shown. We then cut the worm up again with vertical planes *a*, *b*, *c*, *d*, etc. The distances *ab*, *bc*, *cd*, etc., are widths, and can also be laid off on the base line. Next we pass a series of horizontal planes *A*, *B*, *C*, *D*, etc., through the worm. The distances *AB*, *BC*, *CD*, etc., are heights, and are laid off on *MN* as shown.

For the first point, let us locate the intersection of the planes 1, *a*, *A*. This is found by projecting the points 1, *a*, and *A* in the usual way. The next point is at the intersection of the planes 2, *b*, *B*, etc. The rest of the points are found in the same way. In practice, it is simpler to erase the construction lines as they are used, in order to avoid confusion.

Further examples of perspective drawing will be given in a subsequent article.

* * *

Cadmium possesses high corrosion-resisting properties, which, according to *Engineering*, give it a great advantage as a metal to be used for plating. Also, when used as an alloy with copper in telephone wires or in overhead conductors for street railway systems, it adds considerably to the wear resistance of the wires and at the same time has good electrical conductivity. Cadmium is also coming into use for solder and as a constituent of bearing metals.

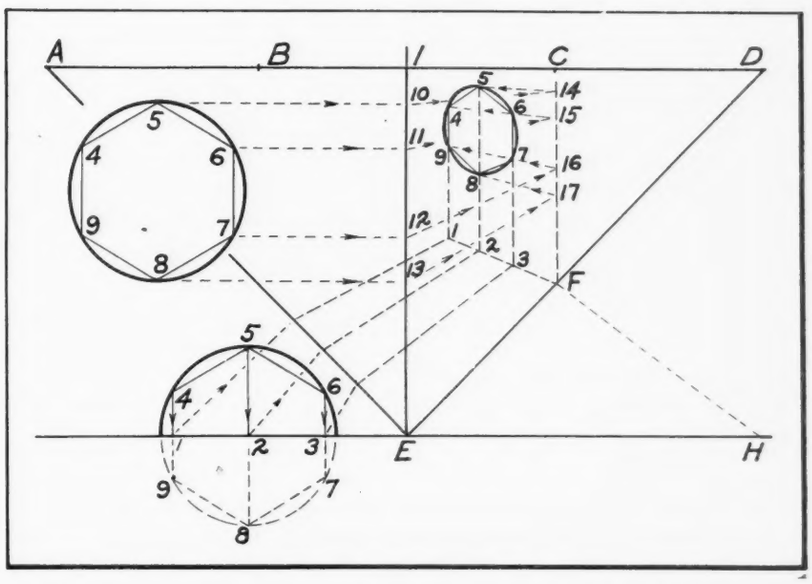


Fig. 13. View Similar to One Shown in Fig. 11, but with Surface Facing to the Left

EARLY HISTORY OF CAST IRON AND STEEL

The first commercial use of cast iron of which there is any record dates back to 1468, and a stove constructed from cast iron appears to have been made in 1474. The process of iron founding as a business started about 1500. Various methods were used and improvements were made until almost 150 years later, or 1645, the first blast furnace in America was established at Lynn, Mass. In 1720, the iron industry started in Pennsylvania, and thirty years later, we have a record of the first cupola being used in England. A patent for a cupola furnace was granted to John Wilkinson in England in 1794. The cupola was introduced into Pennsylvania about 1820.

The development and extension of the uses of wrought iron continued from the latter part of the eighteenth century up to the invention of the Bessemer steel process by Sir Henry Bessemer in 1855. From that time on, the development and use of steel has extended into many fields, crowding out the more expensive wrought iron and castings. The invention of the open-hearth process in 1861 and inauguration of rolling mill methods in 1866 have assisted in this substitution.

The major developments of modern foundry and steel mill practice have occurred during recent years, but we find the general principles fairly definitely established during the last twenty years of the nineteenth century. The pre-eminence of steel among iron products is indicated by the fact that about 75 per cent of the total tonnage of iron products of this country is steel in one form or another.

* * *

Property rights in drawings and designs should be recognized as valid, even if they cannot be protected by the courts in the same manner as a patent.

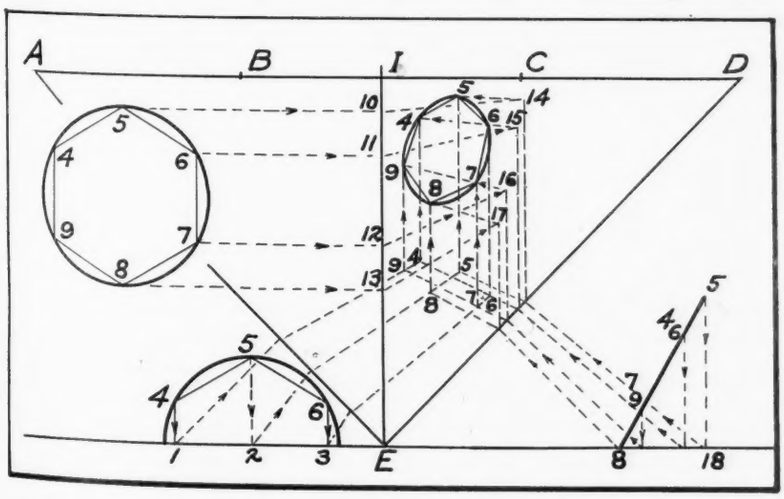


Fig. 14. Hexagon and Circumscribed Circle Shown Tipped at an Angle of 30 Degrees

What MACHINERY'S Readers Think

Contributions of General Interest are Solicited and Paid for

DIMENSIONING DRAWINGS

The current discussion on dimensioning drawings has brought forth the description of a "reference system" developed to eliminate the difficulties experienced with the "only once" and the "duplicating" systems of dimensioning. With this new system, the essential dimensions are given only once, but any other dimensions that may be useful are freely given. The latter dimensions, however, are enclosed by circles to indicate that they are for reference only.

No dimensions need be calculated in the shop when the "reference" system is employed, yet the machinist who finishes the work has full information as to which dimensions he is to use. Thus he can follow the regular dimensions and ignore the reference dimensions enclosed by the circles.

When the regular dimensions are changed in accordance with a change in the design of the part, no inaccuracies or mistakes should result, even if the reference dimensions affected are not properly changed. The regular working dimensions may be repeated in different views and enclosed in circles, the same as the strictly reference dimensions.

JOHN F. HARDECKER

INTELLIGENT HANDLING OF REJECTIONS

Rejections are inevitable in any manufacturing industry that takes pride in its product, but they are a disturbing factor to the shop foremen who have their minds on production costs and shop schedules. With these factors in mind, some foremen often make special trips around the plant trying to get someone to O. K. the using of the rejected parts or to permit them to be "fixed up." Besides the loss of time, this may lead to unpleasant conflicts. The flow of production is interrupted and to the cost of the rejected parts are added all the indirect costs resulting from the irregular procedure followed in such instances.

In one large manufacturing plant, these difficulties are overcome effectively by having a salvage committee. This committee is composed of three members, one from the inspection, one from the production, and one from the engineering departments. They are carefully selected by their respective departments according to their knowledge and experience and their ability to apply their knowledge with common sense. An employe of the tool-crib to whom all rejected material is delivered, acts as clerk of the committee. Meetings are held each morning at a stated hour to consider the accumulation of the preceding day.

All material that is rejected because the workmanship or material does not conform to the specifications or standards goes before the salvage committee, which decides whether it is to be reworked, scrapped, or used as it is. The decision in each case must be unanimous, disagreements being decided by the manager. In addition to these duties, the committee determines which department is to bear the responsibility and replacement charges, which, of course, may be divided among several departments, the clerk notifying the heads of the departments who are responsible.

This procedure provides a well regulated avenue for handling this troublesome phase of production work and reduces the time involved to a few minutes a day. Repeated rejections of a certain part are observed, and a modification of its design, suggested by the committee, often eliminates the cause.

A. A. CROWELL

WHERE CRITICISM SHOULD BE ENCOURAGED

A company purchased a machine that the manufacturer claimed would produce a given number of pieces of an acceptable quality in a certain period of time. After the machine had been set up ready for operation, it was found defective in some minor details. A screw needed replacing at one point, a shaft somewhere else required straightening, and a bearing did not receive proper lubrication for continuous operation. After these things were corrected, however, the machine operated perfectly.

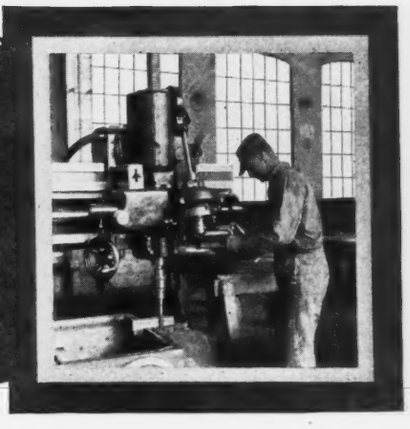
Some time later a representative stopped in for a visit and was told that the machine was satisfactory beyond all expectations. Not a word was said about the corrections made. The result was that hundreds of plants installed machines of the same kind on which a screw had to be replaced, a shaft needed straightening, and a bearing required better lubrication. In each of these plants production was delayed while the necessary repairs or corrections were being made. There are cases where similar conditions prevail indefinitely, because the purchasers feel that to complain would be considered petty faultfinding, especially when the cost of the repairs is small.

In cases where the machine builder uses one or more of the machines in his plant, this is not likely to occur, but there are many machine builders who have no use for their product in their own plants. In such cases, the machine is usually given a running test before shipment, but this test may be made with the machine running idle or the test may not be continued long enough to show up the deficiencies.

When a defect or deficiency is found in a machine, though it may easily be corrected, the customer should consider it his duty to notify the manufacturer, of the deficiency, and the manufacturer should consider such action a distinct favor. The manufacturer cannot see his product as the purchaser sees it, and, therefore, should consider complaints an aid in the perfecting of his product.

R. H. KASPER

Letters on Practical Subjects



DOWEL-PINS WITH PROVISION FOR REMOVAL

While the labor involved in the removal of a dowel-pin may be quite an item, the damage to a valuable part during the extraction by makeshift methods is frequently a greater source of expense. The delay occasioned may also be another important item. By paying proper attention in the design to the apparently trivial problem of pinning, such troubles may almost always be avoided.

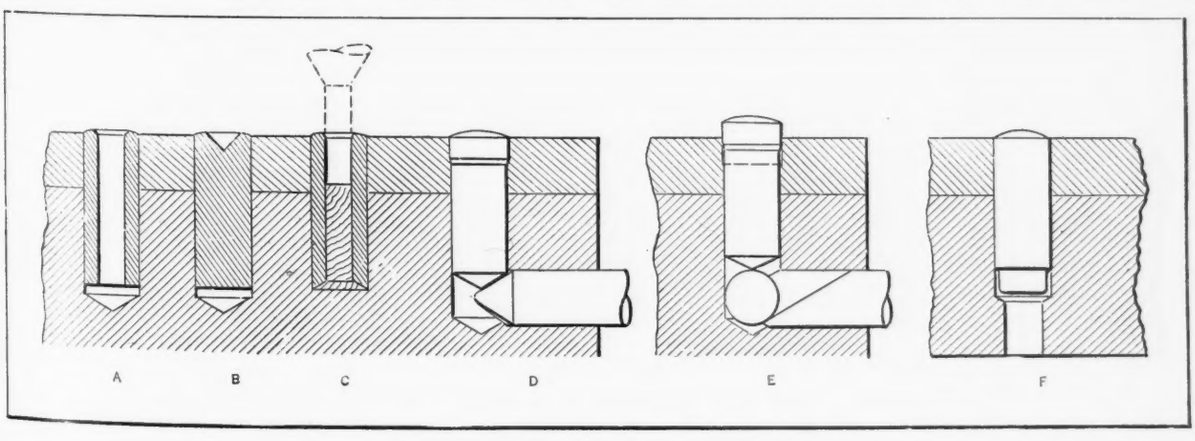
Except in very rare instances, a locating pin, or dowel-pin, should not be incorporated in the design unless some efficient means for removing it is also provided. Of course, the best means is a knock-out hole at the back of the pin, and it will often pay to go to some little trouble to provide this feature in the design. In some cases, a pin with a tapped hole may be used, but this, as a rule, is practicable only for pins of rather large diameter. Sometimes small pins must be used where a straight knock-out cannot be employed. In such instances, a special means for removing the pins is necessary or desirable. In the following are suggested some means of eliminating difficulty in removing dowel-pins.

If the parts to be held together are soft and it is important that the pin seat remain intact, a soft tubular pin such as shown at *A* in the accompanying illustration may be employed. By using several sizes of drills, each successive drill being slightly larger than the preceding one, the hole in the pin can be easily enlarged without danger of running out and spoiling the seat. The hole can be enlarged in this manner until only a thin shell remains which may be extracted with a tap or screw. The strength of a tubular pin proportioned as shown is not much less than that of a solid pin.

When the parts to be held in place by the dowel-pins are hardened and it is not intended that the pins be removed, the use of a soft pin with a center formed at the top as shown at *B* may be advisable. The center at the end of the pin facilitates starting the drill in case it is necessary to remove the pin by drilling it out. A pin of this kind is of special value only in cases where its location is such that any other method of removal would be awkward or difficult.

In cases where a hard pin must be used, a tubular form with a smooth hole through the center, as shown at *C*, should be employed. By filling the hole with oil and driving a closely fitted punch into the hole in the pin, the hydraulic pressure developed will cause the pin to rise. A pin of this kind should always be slightly countersunk on the bottom end, so that the liquid will have a surface on which to exert pressure, which would not be the case if a flat-bottom pin were driven into a flat-bottom hole. Heated paraffin, dropped into the hole in the bushing by means of a fountain pen filler and allowed to solidify, will answer the same purpose as oil, and is preferable because it is less likely to leak under pressure.

Where a direct knock-out is not possible, an angular arrangement such as shown at *D* or *E* may be used if there is a nearby surface parallel with the pin hole. Ordinarily such means should not be used if any of the other methods mentioned can be employed. As shown in the illustration, the knockout hole which is at right angles to the



Dowel-pins which can be Readily Extracted

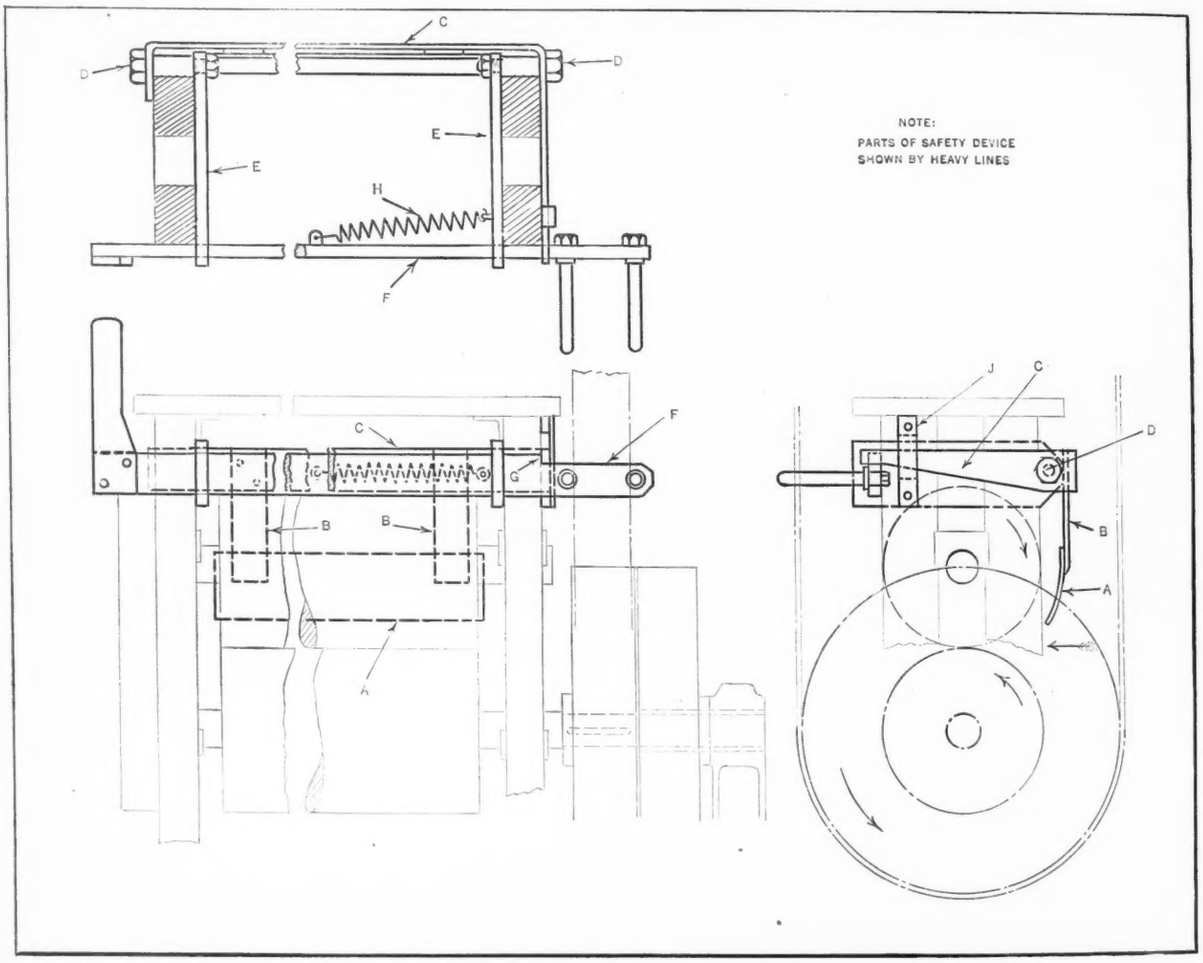
pin hole, is made the same size as the pin hole. The bottom end of the pin is made conical, and the knock-out is started with a pointed punch, and finished by a ball dropped through the knock-out hole under the pin and raised by means of a bevel-ended punch, as shown at *E*. Care must be taken to see that the pin hole and the knock-out hole are both drilled to their proper depths in order to avoid forming pockets under or in back of the ball.

Wherever possible, obtain the frictional hold on the pin by some means other than that of making the entire pin tight in the hole. Slightly springing a long hardened pin is a good and effective way of keeping it in place, and is much to be preferred to giving it an all-over frictional fit. In a short pin, lower end avoids difficulty sometimes experienced from mushrooming when considerable force is required to drive the pin out. This way of forming the end is particularly good when the parts to be held are soft, and when, therefore, the seat has a tendency to become enlarged at the bottom as the pin spreads.

Jena, Germany — HENRY SIMON

SAFETY TRIPPING DEVICE

The safety tripping device shown in the accompanying illustration was attached to a power-driven laundry wringing machine which a government inspector had pronounced unsafe. The device has been found very satisfactory as a safeguard, as well as a simple means for stopping the machine. Referring to the construction of the device, the brass guard *A* is mounted in front of the top roller, being suspended by arms *B* from a flat bar *C* running across the machine frame. This bar is pivoted at the ends on screws *D* which project from flat steel brackets *E*, the ends of which are fastened to the machine frame.



Safety Tripping Device Applied to Power-driven Wringing Machine

One end of bar *C* is bent or shaped to form a latch which rests on the belt-shifting bar *F* at the rear of the machine. The bar *F* is guided in rectangular holes in the brackets *E*, and the top of this bar is cut out to form a stop-shoulder against the latch end of bar *C* at point *G*. If the operator's hand should become trapped between the rollers on

confining the heavy pressure to a small area by slightly enlarging the upper end, as shown exaggerated at *D* and *E*, is a good way of holding it.

Whenever it can be avoided, soft pins should not be used for connecting two parts that are under heavy and repeated shearing stresses. Under such conditions, the pin may become deformed to such an extent that it is hopelessly locked in the hole and permits the parts to have a lateral movement. If a pin must be used, it is better to have one that is hardened and tempered, so that it will break suddenly and cleanly if it breaks at all.

When a pin is made a very tight fit and a straight knock-out hole is provided, it is well to form the lower end of the pin as shown in the view at *F*. The reduction in the diameter of the pin at the

the entering side, the guard would be pressed inward, and as it rocks upon its supporting bar, the latch end would be raised to clear the stop on the belt-shifting bar *F*. The tension spring *H* would then quickly pull back the belt-shifting bar, throwing the belt from the tight to the loose pulley. The handle for starting the machine acts as a stop when the spring moves the shifter bar over, and the spring maintains sufficient tension to keep the belt on the loose pulley. The guide *J* near the end of the latch takes the thrust load exerted by spring *H* when the machine is in operation.

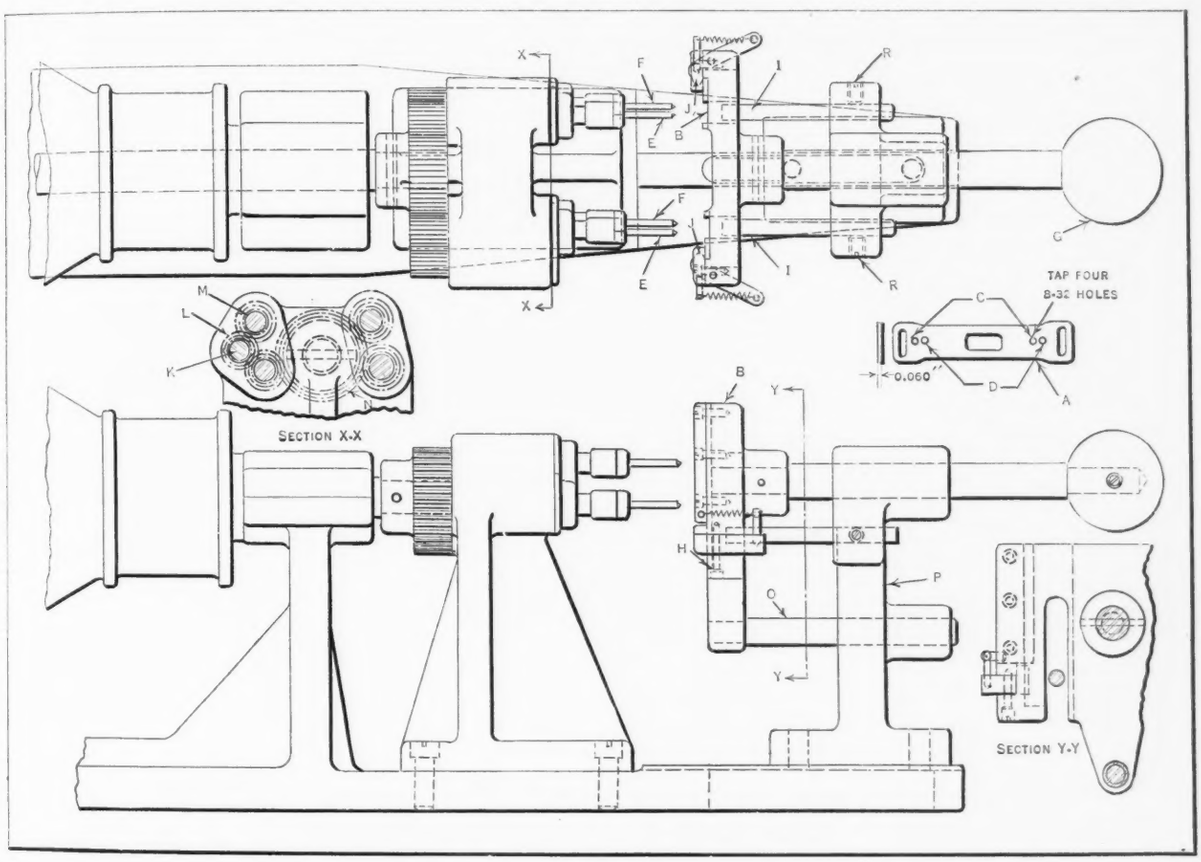
Although the particular device described is employed on a laundry machine, it is obvious that it can be readily adapted for use on other machines, such as presses, shears, and rolling mills. Some form of brake, designed to stop the machine suddenly, can also be incorporated if the momentum of the moving parts is considerable.

Auburn, N. Y. W. S. BROWN

FIXTURE FOR TAPPING FOUR HOLES

The fixture shown in the accompanying illustration is used on a standard horizontal tapping machine, for tapping four holes in steel yokes that form a component part of an electric toggle switch. The holes at each end of the yoke, which is shown at *A*, are so close together that it was considered impractical to design a fixture for tapping all four holes in one piece simultaneously. For this reason, the fixture described is provided with a magazine *B*, designed to hold two pieces of work in position for tapping two holes *C* in one piece and two holes *D* in the other piece at the same time. Thus, the holes *C* are tapped in one piece by the taps *E* while the holes *D* are being tapped in the other piece by the taps *F*.

When the fixture is in operation, the workman feeds the yokes or work into the top of the magazine *B* with his left hand while his right hand grips the knob *G*. Three pieces of work are first placed in the magazine, after which knob *G* is pushed forward, causing the magazine, with the work in place, to be fed toward the taps. As the piece of work at the bottom of the magazine rests on the ledge *H*, it supports the two pieces above while they are being tapped. Upon the return movement of the magazine, the ejecting rods *I* force the piece of work at the bottom out past the retaining jaws *J*, allowing it to drop on an inclined chute (not shown), which guides it into a tote box.



Fixture for Tapping Parts for Electric Switch

When the magazine is again fed forward, the two pieces above the one that is being ejected drop down. This completes the cycle of operations. Of course, the first piece placed in the magazine will not be tapped and the piece immediately above will only have two of the four holes tapped. These pieces may be kept from sliding into the tote box, and again fed into the magazine after the complete cycle of operations has been established.

The four-spindle tapping head of the fixture is mounted on the table of the tapping machine, as is also the tapping fixture. The arrangement of the tapping spindles and the shaft *K* of the idler gear *L* is shown by the cross-section view *X–X*. The idler gear *L* is necessary in order to drive the tapping spindle *M* in the proper direction.

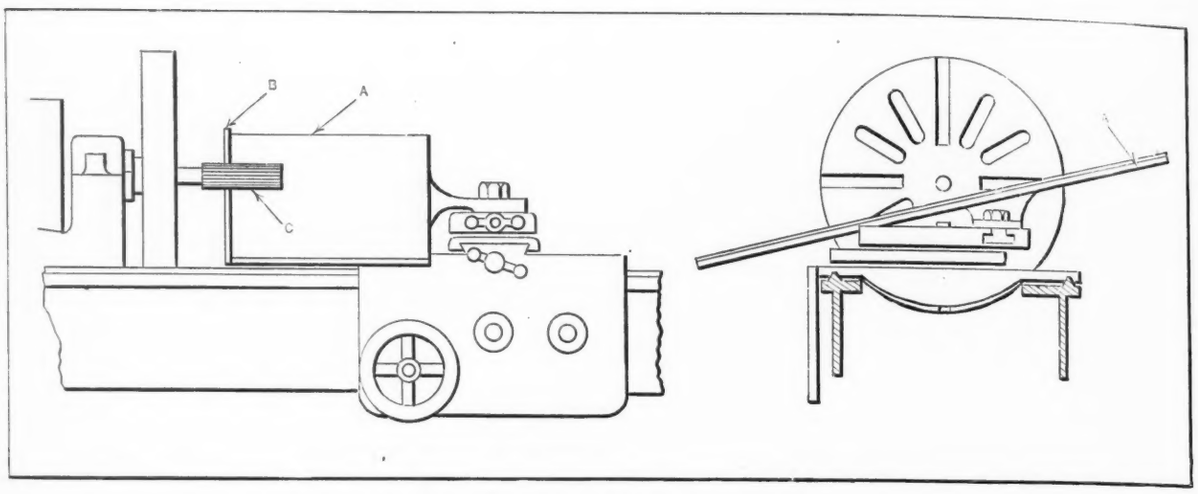


Fig. 1. Mortising Attachment Used on Lathe in Pattern Shop

The magazine *B* is a drive fit on the sliding shaft to which handle *G* is secured. The guide bar *O*, which is a press fit in magazine *B* and a sliding fit in the bracket *P*, prevents the magazine from turning. The construction of the pivoted, spring-actuated retaining jaws *J* is clearly shown in the illustration. The set-screws *R* serve to hold the ejecting rods *I* in position after they have been properly adjusted.

Bridgeport, Conn. J. E. FENNO

MORTISING ATTACHMENT FOR LATHE

Large wooden patterns used in molding machines are subject to severe stresses during the ramming, squeezing, and rapping operations. Patterns that are mortised together hold their shape and withstand this rough treatment better than those of ordinary construction. As soon as this was realized, an effort was made in our shop to devise a simple means for cutting the mortises by machine. The hand-cut mortise was so expensive that the increase in the life of the pattern barely repaid the additional cost. Commercial mortising machines, while excellent for a long run of work of a given kind, were not considered sufficiently versatile in their adjustment for this class of work. Hence, the lathe attachment shown in Fig. 1 was devised for this purpose.

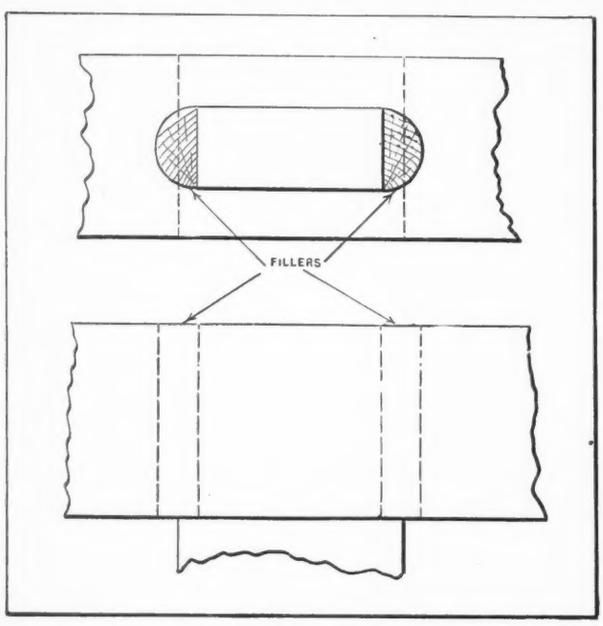


Fig. 2. Use of Filler Pieces in Round-end Mortise

The mortising attachment consists of a flat table *A* supported at one side by a bracket bolted to the compound rest of an ordinary patternmaker's lathe. By inclining the table about 20 degrees to the perpendicular, the necessity for employing elevating screws and vertical gib slides for up and down adjustment is eliminated, as the adjustment for elevation is obtained by the in-and-out movement of the cross-slide.

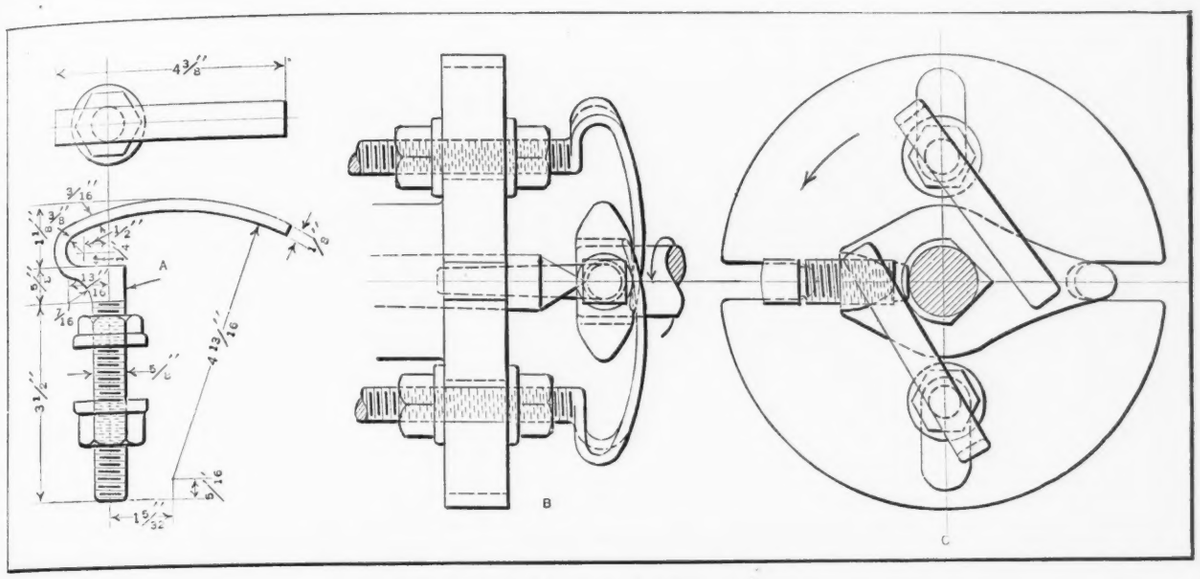
The usual movable fence found on woodworking machines is not necessary with this equipment, as the adjustment for various depths of dovetail is made by positioning the lathe carriage properly on the shears. The guide or fence in this case is simply a bead *B* machined integral with the table. A large faceplate is generally preferable for use with this device, as the table can be set in position for cutting 90-degree mortises by simply swiveling it so that its edge bears uniformly against the faceplate.

Tenons corresponding to the mortise are easily cut on the circular saw. Mortises cut in the manner described have rounded ends, but these can be quickly squared out by hand or the tenons may be rounded out to suit the mortise, or filler pieces, as shown in Fig. 2, may be employed. Patternmakers' dowels split in half may be used for filler pieces. The cutter *C*, Fig. 1, may be of the coarse-tooth type such as is used on milling machines. It is usually advisable to drill a hole to the required depth to receive the cutter when starting a mortise.

Willimantic, Conn. HERBERT A. FREEMAN

LATHE DOG HOLD-BACK

A combination screw and spring for holding a lathe dog back in place when using a steadyrest without employing the tailstock center is shown at *A* in the accompanying illustration. This hold-back device is made from 5/8-inch round tool steel. One end is flattened and bent as shown to form a spring, which serves to hold the lathe dog back in position. The method of applying these hold-backs is shown in views *B* and *C*. One end of the hold-back is



Device for Holding a Lathe Dog in Place

threaded and fitted with two nuts which serve to clamp the device to the faceplate.

It is advisable, particularly when high speeds are to be used, to employ two hold-backs, in order to balance the rotating members properly. In some cases, it may be necessary to drill holes through the faceplate to receive the ends of the hold-backs. Care should be taken to so adjust the hold-backs that the spring ends will exert sufficient pressure on the dog to hold the work back against the center.

Cleveland, Ohio — WILLIAM WILSON

ENLARGING DIAMETER OF PULLEY

An article entitled "Enlarging Diameter of Pulley" in October MACHINERY, page 95, brought to the writer' mind a similar experience. While experimenting with a machine that was in operation and could not be shut down for any length of time, it became necessary to increase the diameter of one of the pulleys in order to obtain the correct speed. The machine was located in a plant some fifty miles from our machine shop, which meant that at least a day or more would be required to obtain a new pulley. The only alternative was to increase the diameter of the existing pulley in some way.

While considering the problem, it occurred to the writer that adhesive tape might possibly be employed to increase the diameter. The pulley was 12 inches in diameter and had a face 2 inches wide. Fortunately, a spool of adhesive tape 2 inches wide was obtained at the nearest drug store. As the exact increase in diameter required was not known, the entire 5 yards of tape on the spool was wrapped around the pulley at the first trial with the idea of unwinding some of the tape if the increase in diameter proved too great. However, the increase of 1/4 inch in the diameter of the pulley obtained in this manner proved satisfactory.

By using tape instead of employing the pattern-maker's kink, no time was lost in waiting for the glue to set. Also it was unnecessary to remove parts of the machine in order to wrap the adhesive tape about the pulley, which would have been necessary in using clamps.

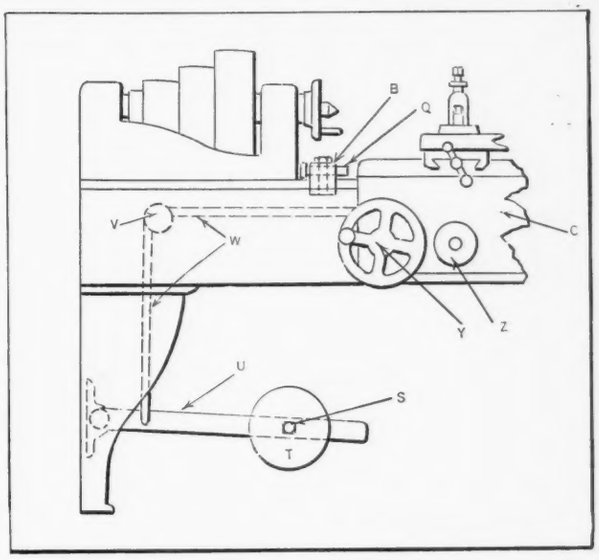
Brewster, N. Y. — A. W. WILKS

WEIGHT-OPERATED FEED AND POSITIVE STOP FOR LATHE

Having a considerable number of shafts to be turned, the lengths of which ranged from 4 to 12 inches, the writer found it desirable to arrange the lathes so that one operator could attend several machines. Each lathe was equipped with a carriage-feeding mechanism driven from the headstock by a belt running on a three-step cone pulley mounted on the feed-shaft. The carriage feed was engaged by a cone clutch consisting of external and internal cone members, which were tightened together by means of a screw and handwheel.

After a number of unsuccessful attempts to adjust the feed mechanism so that the carriage would stop at any predetermined position, the writer decided to discard the regular feeding device and substitute a design that could be depended upon to stop at the desired point. Referring to the illustration, the carriage is shown at *C*. The handwheel for controlling the traversing movement of the carriage along the lathe bed is shown at *Y*.

To the right of the handwheel is shown a knurled knob *Z* which locks the gearing and prevents the



Lathe Equipped with Weight-operated Feed and Positive Stop

saddle from moving. Secured to the saddle midway between the shears is a chain *W* which passes over the pulley *V* and extends down to the bar *U*. Bar *U* is hinged to the cross member which braces the two legs at the head of the lathe and is designed on the cantilever principle.

The weight *T* is cast with a rectangular slot through the center which permits it to slide on the bar *U*. A bolt *S* is employed for locking the weight in place after the required adjustment is made. A steel block *B* is fitted to the front shear and provided with a clamping bolt by means of which the block can be secured at any desired position. The block *B* is tapped to receive a case-hardened screw *Q* having a fine thread. This screw serves as a stop for the carriage, the fine thread

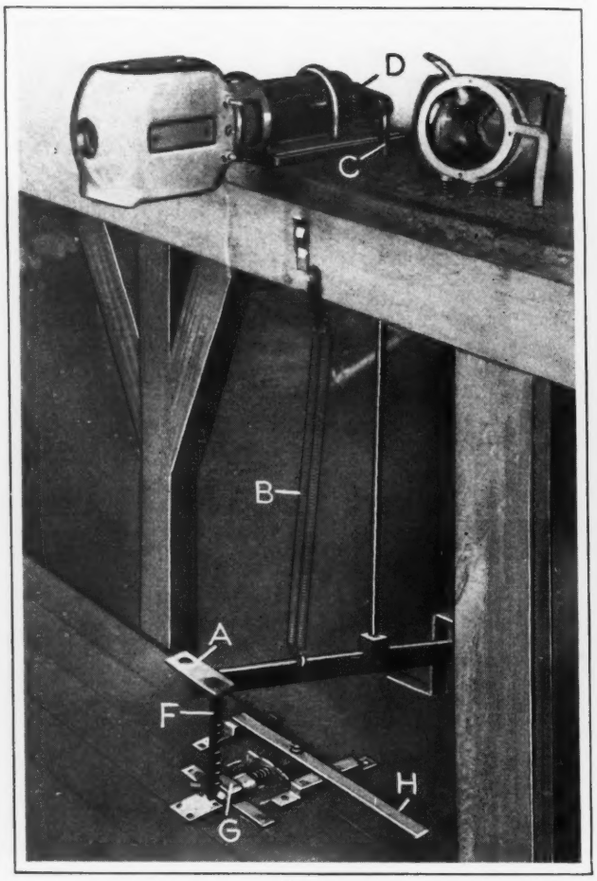


Fig. 1. Work-holding Mandrel with Work in Place

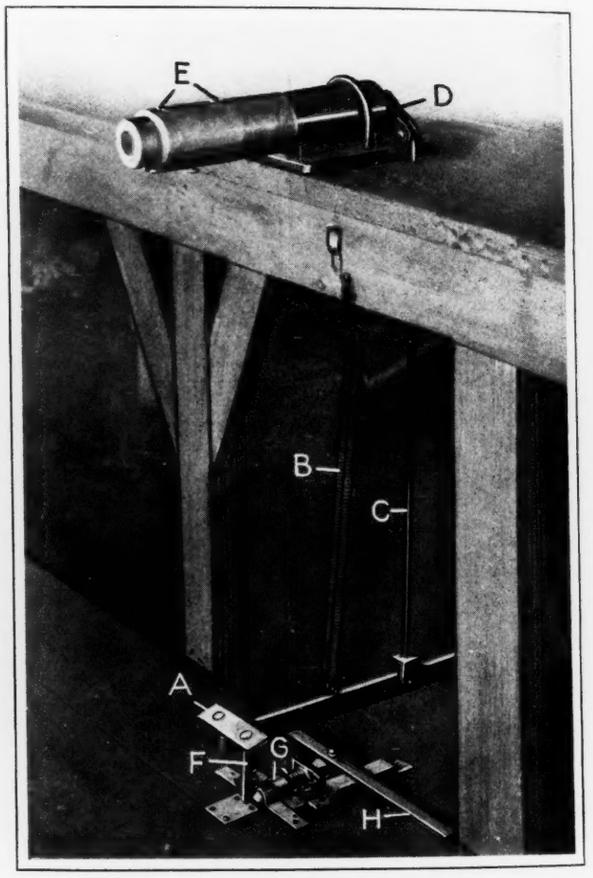


Fig. 2. Mandrel Shown in Fig. 1 with Work Removed

making it possible to obtain accurate settings. The weight *T* is so adjusted on the bar *U* that it will feed the carriage along the lathe ways at a speed suitable for the work being turned. After the carriage has been stopped by the end of screw *Q*, it is returned by means of the handwheel *Y*. While a new piece of work is being placed between the centers, the carriage is locked against movement by engaging the gears controlled by knob *Z*.

London, England — ROBERT JULIAN

WORK-HOLDING MANDREL OPERATED BY FOOT-TREADLE

An unusual method of holding work on a bench while assembling certain parts is illustrated in Fig. 1. The fixture or mandrel consists of a foot- and spring-operated device employed to hold small special motor cases in place while setting studs, connecting wires, and doing various other assembling jobs. The motor case to be assembled is slipped over the mandrel and is locked in place by releasing the foot-treadle *A*, which is at once pulled upward by the two coil springs *B*. This movement actuates cams inside the mandrel through rod *C* and lever *D*. The cams, in turn, cause pins *E*, Fig. 2, to be pressed outward against the inside of the motor case with sufficient force to hold it securely in place.

To withdraw the pins *E* for removing work from the mandrel, the operator pushes down the foot-treadle *A*. The ratchet *F* then engages the spring pawl or dog *G*, locking the foot-treadle in the down position. After a motor case has been put on the mandrel, the ratchet dog *G* is released by moving the foot-operated lever *H* toward the bench. The coil springs then come into action again, as described, and lock the work in place on the mandrel.

For work requiring greater holding pressure than can be readily obtained by means of the springs, the action of the device can be reversed, the foot-treadle being pressed down to force the clamping pins *E* outward. The springs are then employed to release the work.

Cleveland, Ohio — AVERY E. GRANVILLE

* * *

Aluminum was unknown commercially until approximately thirty-five years ago. Even in 1913, the world's production of aluminum was only 64,000 tons. In 1926, this had risen to 235,000 tons.

Shop and Drafting-room Kinks

REMOVING SMALL DENTS FROM THIN TIN STRIPS

In removing small dents from thin tin casing strips, pieces of old hardened water pump packing, used in the manner shown in the accompanying illustration, will be found convenient. The tin strips are placed on a flat surface, covered with a short length of the packing, and hammered, as illustrated. In this way, it is possible to flatten the strips out quickly without marring the surface. It has proved a satisfactory method.

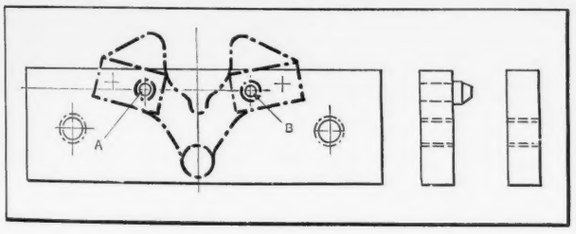
Using Old Rubber Packing to Remove Dents

Missouri Valley, Iowa FRANK W. BENTLEY, JR.

MILLING MACHINE VISE JAWS

The special jaws shown in the accompanying illustration were made up and secured to the inside of the regular jaws of a milling machine vise by means of machine screws. The jaws were designed to hold the irregular shaped bridge casting shown in dot-and-dash lines while milling the two projecting lugs.

Jaws made along the same lines as the ones shown have been found to greatly facilitate the milling of many irregular shaped castings. As will be evident by referring to the illustration, two plugs *A* and *B*, which are spaced to fit into two holes in the work, are placed in one jaw in the correct position to locate the piece for the milling operation.

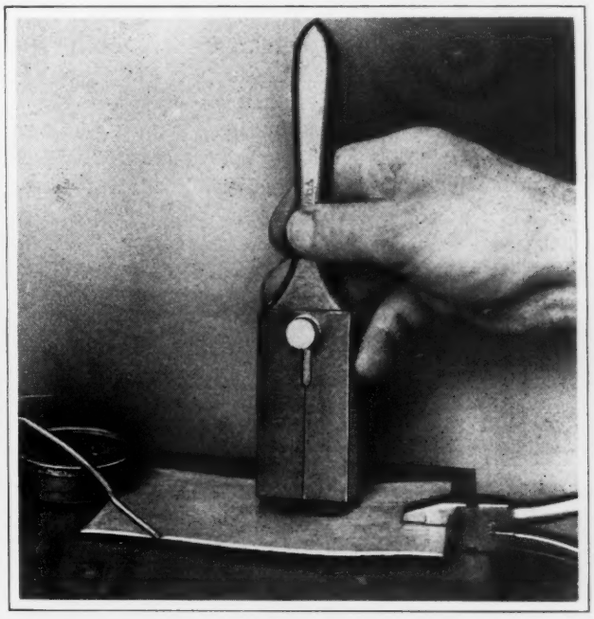


Special Jaws for Milling Machine Vise

Rochester, N. Y. EDWARD T. HEARD

ADJUSTABLE BRUSH STIFFENER

For certain varieties of tinned work, a worn brush is usually preferred for spreading the solder, because the bristles are stiff. The bristles in a new brush bend and spread too much to attain good results. Old brushes cannot be obtained until new ones are worn down. Something that would give the same results during the full life of the brush was required. The idea finally adopted is shown in the accompanying illustration. The brush is enclosed by a piece of sheet metal, the ends of which come together; the sheet is cut away a little on top to form a slot, as shown. A hole is drilled through the wood and a screw pushed through the hole, so that a knurled nut and washer can be used to tighten the device. As the brush wears down, the metal band is moved up to suit, and tightened securely in place by the nut.

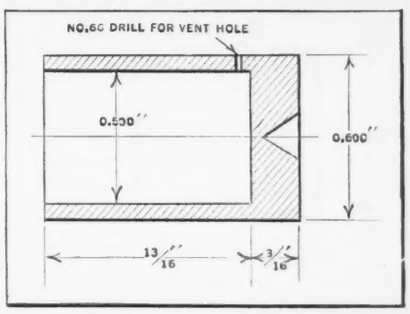


Adjustable Brush Stiffener

Hamilton, Ont., Can. H. MOORE

TOOLMAKER'S EXTENSION BUTTONS

It often happens that the regular toolmaker's buttons are too close together to permit using an indicator conveniently. In such cases, extension buttons like that shown in the illustration herewith will be found useful. With a button of this kind slipped over a regular button, it is a simple matter to locate the work by means of a "wiggler." The center in the extension button is also useful in obtaining a rough set-up of the work on the lathe faceplate. The dimensions shown in the illustration are for extension buttons intended for use with standard 0.500-inch toolmakers' buttons.



Extension Button for Tool-room Work

Dayton, Ohio ROBERT CROSBY

Questions and Answers

WORKMEN'S COMPENSATION

I. L. Y.—Under what circumstances is an employer liable under the common law for injuries sustained by an employe who is not performing his regular duties? Please give examples.

Answered by Leo T. Parker, Attorney at Law

The law is well established that an employer is not liable where an employe sustains injuries while not acting within the scope of the employment; but an employer is not always relieved of liability when the injury occurs while the workman is not engaged in the performance of his regular duties. For example, in a recently decided case the Court held that when an employe stops work because of necessity and is injured, the employer is liable for damages to the same extent as "if the workman actually were performing his regular duties."

In another case, the Court held that where an employe temporarily discontinues his work to obtain a drink of water, he is within the scope of the employment to such an extent that where injury is received the employer is liable. The reason for this decision is that obtaining a drink of water is an act of necessity which must be performed several times each day. Therefore, when an employe leaves his work for purposes of necessity, he has a legal right to pass over such parts of the employer's premises as may be required.

On the other hand, if an employe does not go to a place provided by the employer, and is injured while going to or from a distant place of his own selection, the injury does not arise from the employment and he is not entitled to compensation.

Obtaining fresh air is deemed a necessity, under certain circumstances. For instance, a person who was employed in a factory suddenly found it necessary, by reason of the presence of steam, to open a window to let in fresh air. While in the act of opening the window, he was severely injured. In deciding this case in favor of the employe, the Court explained that it was a natural and reasonable thing under the circumstances for the man to leave his employment temporarily to open a window to permit fresh air to enter.

Numerous litigations have resulted where employes have been injured while off duty and walking from place to place in the plants of their employers. For example, where a man walked into a high tension electric wire while walking around the premises, without authority, the Court held that he was not entitled to recover damages from the employer. And where it was disclosed that an employe was injured while going to another part of the factory to visit other workmen, the Court held he was not entitled to recover damages. In still another case, it was shown that an employe, who was not employed regularly on the job, was permitted by the foreman to roam about. In this instance, the Court held the employer liable.

When employes are entitled to rest periods and the employer does not specify the place where they may rest, they are permitted to use their own discretion in selecting the proper place, and the employer generally is liable for injuries sustained.

ANGLES OF SINGLE HELICAL GEARS

W. A. D.—When single helical or "twisted spur gears" are used on parallel shaft drives to obtain smoother action than is obtained with ordinary spur gears, how much should the teeth incline relative to the axis of the gear?

A.—In designing gears of this type, the aim is to incline the teeth sufficiently to secure smooth action without excessive end thrust. The angle should be such that one end of a tooth remains in contact until the opposite end of the following tooth has come into engagement. The angle required to obtain this overlapping depends upon the face width of the gear, decreasing as the face width increases.

According to most text-books, the maximum angle for single helical gears should be about 20 degrees, although one prominent manufacturer mentions that the maximum angle for industrial drives ordinarily does not exceed 10 degrees, and this will give quiet running without excessive end thrust. On some of the heavier single helical gearing used for street railway transmissions, etc., an angle of 7 degrees is employed. It will be understood that this is the helix angle between the tooth and the axis of the gear.

The selection of an angle may depend to some extent upon the allowable end thrust, as, for example, in cases where a certain amount of end thrust would be tolerated in order to use a larger angle and obtain smoother tooth action. Incidentally, the end thrust (neglecting friction) may be determined by multiplying the tangential load upon the teeth by the tangent of the helix angle, measured from the axis. The tangential load, in pounds, may be determined as follows: Multiply horsepower to be transmitted by 33,000, and divide the product by pitch-line velocity, in feet per minute.

* * *

INCREASED USE OF AIRPLANES

Airplanes are being used in business to an ever increasing extent. In the oil industry, particularly, airplanes are frequently used by officials to reach oil fields that cannot be quickly or conveniently reached by other means of transportation. Large power companies are also using airplanes for reaching outlying power lines, and there is a growing tendency toward the use of airplanes for sport or pleasure purposes. At present there are about 600 air ports throughout the country, and it is believed that in another year every city and town of any importance will have made arrangements for a landing field.

Producing Transformer Laminations

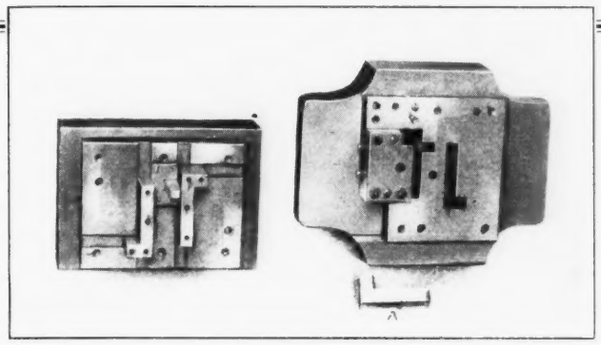


Fig. 1. Punch and Die for Forming Transformer Laminations

TRANSFORMERS for obtaining a step up or a step down in the voltage of electric currents play an important part in the present-day radio sets and the so-called battery eliminators and electrical equipment used in operating radio sets from electric house-lighting current. Such transformers consist primarily of a core and the primary and secondary windings required to give the step up or step down in voltage desired. The core is built up of steel laminations, generally L-shaped, as shown at *A*, Fig. 1, which are assembled to form a hollow square, with the primary and secondary windings usually located on opposite sides of the core.

The blanking out of the transformer core laminations shown emerging from the die through chutes *A*, Figs. 2 and 3, is an important factor in the manufacture of the transformers. These illustrations were obtained at the plant of the Fansteel Products Co., North Chicago, Ill., where Henry & Wright dieing machines are used in place of hand-fed machines. It is stated by the A. C. Nielsen Co., of Chicago, Ill., the originators of Nielsen Surveys, from which source this information has been obtained, that the installation of the new machines made it possible to increase production 169 per cent, and that the life of the dies was increased 59.1 per cent. The reduction in production costs equalled the investment on the new machines after they had been used eighteen months. Thirteen ordinary hand-fed presses would be required to equal the production rate of the five new machines, which totaled approximately 16,150 per hour. The machines are equipped with double roll automatic feed.

The simple square-cornered transformer laminations are made from 3 to 3 1/2 per cent silicon steel, of No. 26 gage, and the finished laminations vary in size from 3 by 3 1/4 to 4 by 5 inches. No lubricant is required for this work. The steel is received in 30- by 96-inch sheets, and is cut into strips of suitable width before being delivered to the dieing machines on lift-type platform trucks.

Each operator has charge of two machines. His duties consist of feeding the strips to the rolls, end to end, and keeping the discharge chutes clear, so that the finished strips can drop into the transport boxes. The operators are comparatively unskilled men and are paid on the poundage output basis.

The machines are operated at a speed of 135 working strokes per minute. The double dies shown in Figs. 1 and 4 cut two laminations at each stroke. The average daily production of the five machines is about 210,000 finished pieces. This, on a thirteen-hour run, gives an average production of 16,150 laminations per hour out of a possible total of

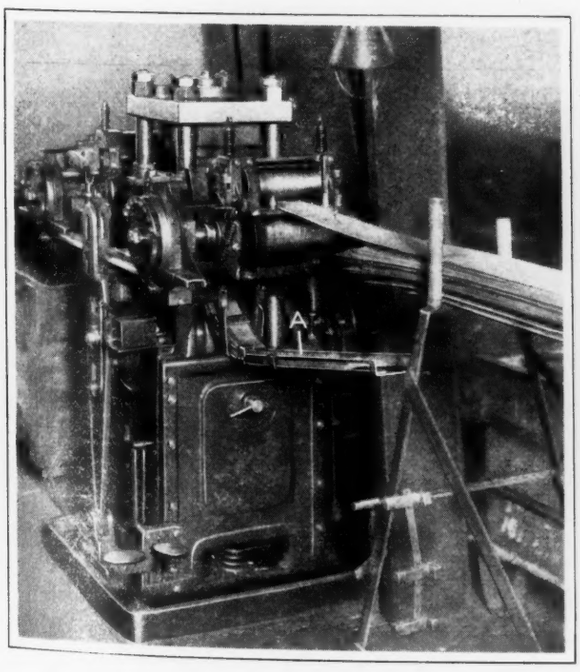


Fig. 2. Feed End of Dieing Machine Equipped for Producing Transformer Laminations

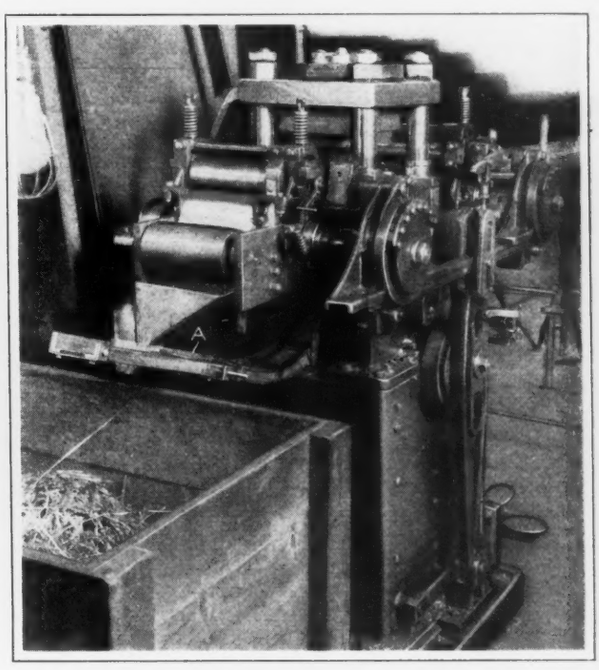


Fig. 3. Scrap Stock Discharge End of Dieing Machine Illustrated in Fig. 1

16,200. The press efficiency, based on the ratio of actual to total possible production, is about 99.7 per cent. Runs averaging 20,000 pieces per hour are not uncommon when the machines are operated at higher speeds under the abnormal demands at certain seasons of the year. Spoilage is almost negligible, except that which occurs when the die cuts at the junction of two strips.

The presses formerly used were of the hand-fed type, each requiring an operator. The maximum safe speed was 70 working strokes per minute, and the output depended to a large degree on the skill of the individual operator. The number of strokes actually used varied from 40 to 60, and the average press efficiency was about 71.4 per cent. Six thousand laminations per hour was considered a good average rate, but the total output per press

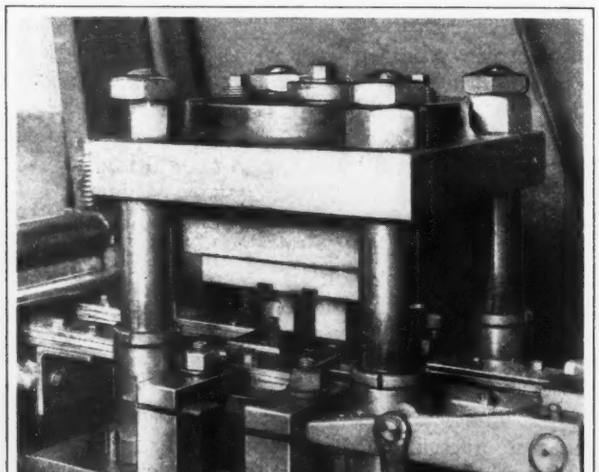


Fig. 4. Assembled Punch and Die Shown in Fig. 1

fell as low as 40,000 per day, or 3080 per hour. The average daily production on a thirteen-hour schedule was about 78,000 laminations.

Life of the Dies

Dies of similar design were used in both the hand-fed presses and the new roll-fed machines. They are 8 inches square, 1 1/4 inches deep, and backed up with a 2-inch shoe. The dies on the presses formerly used lasted for slightly over five months, and were good for an average of 480,000 working strokes between grinds. The average set could be reground about ten times and the total life was about 5,280,000 working strokes.

The dies used on the present machines have a life of a little more than three months, but make an average of 600,000 working strokes between grinds. Each set of dies can be reground from twelve to fourteen times, and the average total life is 8,400,000 working strokes.

The improved automatic feed, as shown in Figs. 2 and 3, enables one operator to attend two machines. The roll feed also tends to minimize spoilage, and accidents are less likely to occur with presses equipped with this feed.

JACOBS DRILL CHUCKS STANDARDIZED

The advantages of standardization are coming to be more and more appreciated in the mechanical field. The confusion and waste arising from a great number of models and sizes of tools of different descriptions, where a smaller number would perform an equally satisfactory service, is obvious. One of the latest efforts toward thorough-going standardization has been undertaken by the Jacobs Mfg. Co., Hartford, Conn., in connection with the company's line of drill chucks.

It is just twenty-five years since the first Jacobs chucks were placed on the market in three different models. As in every growing business, additional sizes and models were added to meet new conditions, until sixty-seven different drill chucks were listed, comprising changes in the older models made to keep pace with new requirements in industry, and new types for new uses.

The company has made a thorough study of the requirements in the entire mechanical industries, and concluded that a great many more types and sizes are made than the trade actually needs. Leading manufacturers of drilling equipment making use of the company's product have been consulted; all favor a move toward standardization, and several have adopted the suggested standard tapers and threads. As a result, special tapers and threads have been largely eliminated, and although an entirely new model of drill chuck has been added—the keyless "Portomatic," described in the New Machinery and Tools section of this number of MACHINERY, which is made in eleven different sizes—it has been found possible to replace the sixty-seven styles formerly listed by thirty-six. As eleven of these apply to the new model, it means that twenty-five sizes take the place of the sixty-seven formerly listed, the standardization work having been so carried through that every requirement filled by the former line is taken care of by the present standardized equipment.

Drill chucks have three general avenues of distribution—the dealer, the user, and the manufacturer who equips his own product with chucks. To the dealer, standardization brings the advantages of smaller stock, smaller investment, and greater turnover. From the standpoint of the user, there are the advantages of fewer types in the stockroom and the saving of time by fewer changes of tools when doing productive work. Furthermore, he can fill his requirements at any time, because his dealer is able to carry a full line of the standardized models in stock. There is, of course, on the part of the user, the traditional desire to continue to use the models that he has bought in the past, but the advantages of changing over to the standardized equipment are too obvious to lend much weight to the slight temporary inconvenience of making the change. The manufacturer who uses chucks to equip his product should immediately see the advantage of equipping them with a standardized product which makes it easy for the ultimate user to obtain additional chucks when required.

The growing appreciation of standardization is evidenced by the spirit with which this new step in standardization has been received, especially by the manufacturers who wish to furnish their equipment with standardized chucks.

Maintaining Shop Equipment*

MAINTENANCE engineers seem agreed that too large a proportion of machine repairs are necessitated by insufficient lubrication. One engineer who made a special investigation concerning this phase of maintenance expense discovered that 10 per cent of all repairs in his plant for one year were chargeable to lack of lubrication. The total repair bill for that year amounted to $400,000.

Repair costs in this plant due to inadequate lubrication were greatly reduced after a force of men operating under a foreman was appointed to lubricate all machines and shaft bearings in the plant. These men are responsible for the operation of equipment in so far as lubricant is a factor. Oils to meet various conditions are selected after consultations with experts of the company from which the oils are purchased.

Other Methods of Solving Lubricating Problems

Practically the same plan is followed by the Hess-Bright Mfg. Co., with the exception that the smaller machine tools are oiled by the individual operators. Here, too, it has been found desirable to adopt different lubricants for certain machines and make extensive changes in lubricating systems. Precautions are usually taken to prevent dirt from getting into the oil by filtering it close to its point of entrance on the bearing surfaces. It is sometimes desirable to have operators attend to the oiling of their own machines, because this makes them take pride in keeping the machines in good working condition.

When an operator is assigned to a machine at the plant of the National Cash Register Co., he is thoroughly instructed in oiling the machine, and it is then inspected for a few weeks by the foreman of the department to make sure that enough lubricant is being provided. Extra large oil-cups are applied to machines, and automatic lubricators used wherever practicable. In some departments of this plant, however, it has also been found best to have experienced men devote all their time to oiling machines and motors. Countershaft and lineshaft bearings are oiled by men from the millwright department.

The foreman of each department in the plant of the General Electric Co. is responsible for the operation and upkeep of each machine and for the instruction of the operator concerning its use. Particular attention is given to lubrication, and an automatic system operating from a central tank is installed wherever possible. Special attention is paid to parts requiring grease lubrication under pressure.

When Should Machines be Replaced?

Records of repairs made on all machines should be carefully kept, so that it will be an easy matter to ascertain when machines should be replaced because of excessive upkeep costs. Repairs amounting to $400 or $500 may represent true economy on a machine costing, say $4000, but if extensive repairs are necessary six or seven times, it is generally far better practice to replace the machine. It is the practice of the Hess-Bright Mfg. Co. to consider the purchase of new machinery whenever the repairs of a machine for one year approach 20 per cent of the purchase price of new equipment.

Machines should, of course, also be replaced when they become so obsolete that much higher rates of production or a better product could be obtained with more modern equipment. If the saving in labor plus the saving in repairs will pay for a new machine in about two years, the new machine is considered a sound investment by the Hess-Bright Mfg. Co. Other concerns allow considerably more time for savings to cover the machine price.

When adequate records of repair costs are maintained, it becomes an easy matter to send periodical reports to the various departments, showing the cost of repairs to the equipment in those departments. It is the practice of the Westinghouse Electric & Mfg. Co. to issue such reports monthly, and the records show whether the repairs have been occasioned by wear, accident, or negligence.

Records kept by the General Electric Co., in addition to showing costs of repairs, give general descriptions of the machines, including the capacity, feeds, speeds, maximum and minimum travel of important working parts, price of the machine, and price of each attachment, etc. Each year a new depreciated value is marked on the card.

Safety Devices Supervised by Maintenance Men

At the General Electric Co. a subdivision of the maintenance department is assigned the duty of seeing that all machines are adequately guarded and that periodical inspections are made of cranes, elevators, steam boilers, etc. The repair department of the Westinghouse Electric & Mfg. Co. is also responsible for the provision of guards to prevent accidents. In this plant more accidents have been found to be caused by dropping parts than by improperly guarded machines. Few breakages occur nowadays from permitting a wrench or other part to fall into the mechanism of a machine.

How Maintenance Men can Serve Machine Builders

Maintenance engineers are in a position to offer a real service to machine tool builders by pointing out any faulty mechanism that may be discovered when a new machine is put into service. It is the custom of the Westinghouse Electric & Mfg. Co. to give manufacturers a detailed report of any trouble experienced with a machine, so that the conditions can be obviated in future equipment.

*Based upon a symposium of five papers read before the Machine Shop Practice Division of the American Society of Mechanical Engineers at its annual meeting December 5 to 8. The papers were prepared by George H. Ashman, General Electric Co., Schenectady, N. Y.; W. H. Chapman, Harrison, N. J.; J. R. Weaver, Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.; William Hartman, National Cash Register Co., Dayton, Ohio; and C. S. Gotwals, Hess-Bright Mfg. Co., Philadelphia, Pa.

Multiple-prong Shearing Die

By F. SERVER

THE die shown in Fig. 1 shears the ends on three prongs *Z* which are made as an integral part of a flat plate *X*, the outline of which is shown by heavy dot-and-dash lines. A side view of the die is shown at the left, and a front view at the right in Fig. 1, while in Fig. 2 is shown a plan sectional view of the die. In this die, are combined the features of a hand-clamp and a sub-press arrangement. The unit attached to the ram serves to operate the die shearing members that are secured to the die-bed.

The work *X*, shown by heavy dot-and-dash lines, is placed in the position shown over a formed tool-

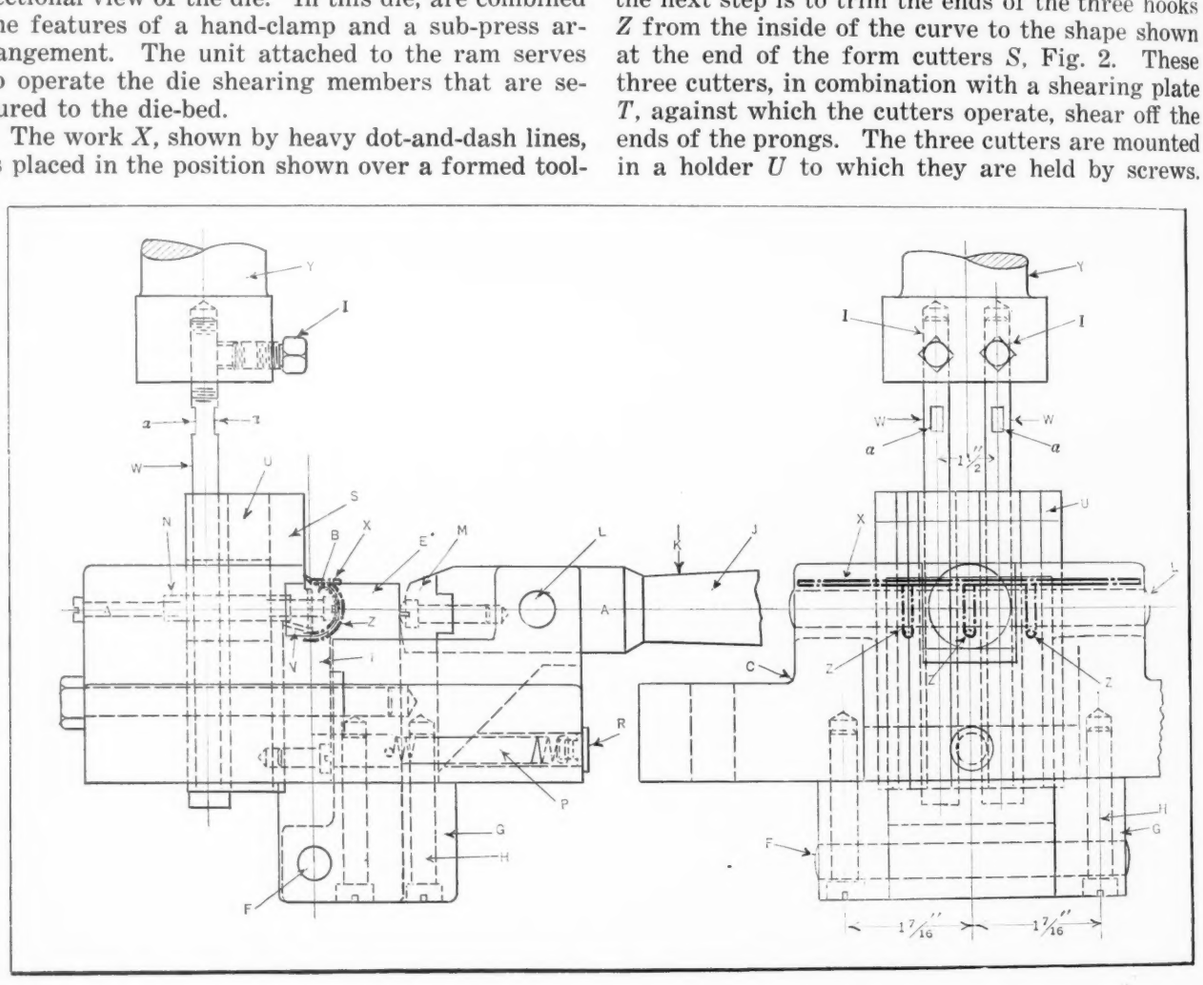


Fig. 1. Side and Front Views of Prong Shearing Die

steel radius piece *B*, which is held to the main cast-iron portion of the die *C* by means of screws *D*. A swinging clamp *E*, which pivots on a hinged pin *F*, is attached to the die by means of a block *G* secured by screws *H*. The clamp *E* is caused to hold the work in position by means of a hand-operated lever *J*, which is pushed down in the direction of the arrow *K* by the operator. As lever *J* pivots on pin *L*, the cam surface of block *M*, attached to lever *J*, clamps the swinging member *E* against the work.

Only the working portion of the lever *J* is shown, the handle, which is extended out about 10 inches to give the operator a good grip, being broken off. When the lever is swung up to about a 45-degree angle, the swinging clamp *E* is pulled back by spring *P*. Spring *P* passes through a hole in the base of the casting and is hooked into a retaining pin *R* in such a manner that it pulls the swinging clamp back when the lever is swung up to permit the removal of work.

After clamping the work in the position shown, the next step is to trim the ends of the three hooks *Z* from the inside of the curve to the shape shown at the end of the form cutters *S*, Fig. 2. These three cutters, in combination with a shearing plate *T*, against which the cutters operate, shear off the ends of the prongs. The three cutters are mounted in a holder *U* to which they are held by screws. The cutters *S* are shaped at *V* to give a hooked trimming surface. It will be evident that with the arrangement shown, it is only necessary to move cutter-holder *U* down and up to trim the prongs.

To obtain the required movement of holder *U*, two long threaded screws *W*, having heads at their lower ends, are screwed into a holder *Y* which, in turn, is secured to the ram of the punch press. These screws are adjustable and are securely locked, after the adjustment is made, by means of brass shoes forced into them by screws *I*. The brass shoes prevent the threads on screws *W* from being injured. Flats *a* cut on screws *W* permit them to be adjusted by means of a wrench.

The two posts *N*, fitted in counterbored holes in the casting and block *B*, constitute an interesting

feature of this die. Screws passed through the block and through the casting serve to hold these posts in place, so that they act as braces and take the thrust of the clamping pressure. These posts pass through elongated slots in the sliding cutter carrier *U*. In operating the die, the work is securely clamped in place as shown, after which the operator trips the press, and the ram containing holder *Y* descends until the lower end of the holder strikes the top of the cutter carrier *U* and forces it down, thereby causing the cutters to descend and trim the prongs. As this action takes place, the screw studs *W* pass downward through the holes in the cutter carrier *U*, and then as the ram of the press comes up, the heads of the studs *W* pull the cutter carrier up clear of the work, so that the part can be removed and another part inserted. The trimming of the prongs is thus a very simple operation. For convenience of manufacture, the die-bed is made in two parts, which are separated and tongued together on line *b–b*, Fig. 2.

* * *

TESTING STEEL PARTS BY MAGNETIC MEANS

The testing of steel parts by magnetic means for discovering minute cracks in the surface is a method that has recently been developed as a practical means of testing in ordinary shop work. Railway and trolley car axles have been inspected by such means in England with very satisfactory results. The cracks that can be detected by magnetic means are so minute that they could not possibly be found by the ordinary visual inspection to which the axles have been subjected in the past.

The new process consists of highly magnetizing the steel, whereby lines of force flowing at right angles to the direction of any crack will be formed. If any crack or flaw exists, magnetic poles are formed across it, and it only remains to provide means for detecting the external lines of magnetic force to reveal the existence of the crack. This is done by covering the part being tested with a solution or ink containing iron powder in a finely divided state; the iron powder adheres to the crack and shows it in a very definite manner.

This method has been used for some time by one of the large manufacturers of airplane engines in England for detecting hair-line cracks not discernible by optical inspection. Fine iron dust suspended in paraffin is used for this purpose. For small specimens, two ordinary permanent magnets may be used to produce the magnetic lines of force in and about the steel specimen to be tested. Magnets from old magnetos have been found to give good results. For larger pieces, electro-magnets are used.

This principle of testing has also been successfully adopted by the London County Council Tramways in testing street car axles, using appliances made by the Equipment & Engineering Co., 2 Norfolk St., Strand, London, W.C. 2, England. In the case of street car axles a large electromagnet with extended pole pieces machined to embrace the axle are used. The pole pieces make contact with the axles near the hubs, for it usually found that the cracks occur in that vicinity. The magnet is supported from a traveling crane. The electric power required is 150 watts, and to guard against trouble due to discharge by reason of the highly inductive nature of the device, a special sectional method of winding is used, together with a special control switch. The latter is arranged with non-inductive discharge circuits which are connected across the ends of the coil at the moment the switch is turned off. In this way, cracks are detected, which, even if they might be visible to the naked eye, could easily be mistaken for tool or wear marks.

For large parts such as locomotive crankshafts, special designs of magnets are being evolved which magnetize them through from end to end and permit the rapid and systematic inspection of every portion, including the webs and crankpins.

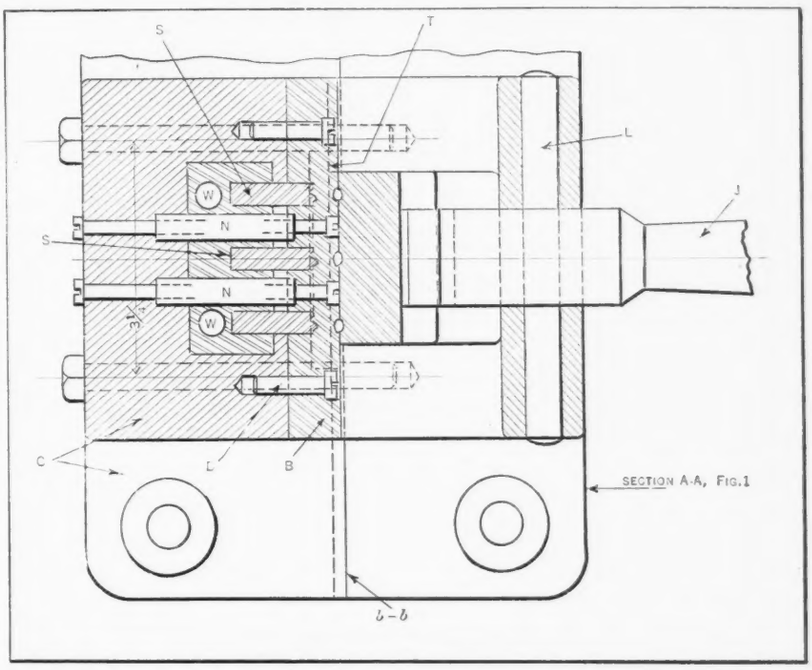


Fig. 2. Plan Sectional View of Die Shown in Fig. 1

The ink used is of a special nature and has, perhaps, given the most trouble in the development of the equipment as a commercial process. The fact that the ink itself became magnetized in use to such an extent that each minute grain became a magnet was a matter of much difficulty. Early troubles were experienced from the free iron adhering more or less all over to the part under test. Attempts to demagnetize the ink were not successful, and it was not until a method was devised of producing by heat-treatment and chemical means a practically pure iron in finely granulated form that success was ultimately achieved. The particles are held in suspension in a special hydrocarbon solution which is also treated to prevent the entry of water which would soon render the free iron useless.

* * *

Six per cent of all passenger automobiles are owned by business houses and used strictly for business purposes. There are 1,140,000 cars in the United States so used.

BRONZE AND BRASS CASTINGS FOR GEARS

The recommended practice for bronze and brass castings for gears, details of which are given in the following, has been approved by the American Gear Manufacturers' Association.

Materials Covered—These specifications cover non-ferrous metals for spur, bevel, and worm gears, bushings and flanges for composition gears.

Basis of Purchase—This material shall be purchased on the basis of chemical composition.

Process—The alloys may be made by any approved method.

Use and Chemical Composition

(a) For spur and bevel gears, use the hard cast bronze S. A. E. No. 62 or the well-known 88-10-2 mixture, keeping within the following limits: Copper, 86 to 89 per cent; tin, 9 to 11 per cent; zinc, 1 to 3 per cent; lead (maximum), 0.20 per cent; iron (maximum), 0.06 per cent. Good castings made from this bronze should give the following minimum physical characteristics: Ultimate strength, 30,000 pounds per square inch; yield point, 15,000 pounds per square inch; elongation in 2 inches, 14 per cent.

(b) For bronze worm-gears, two alternative analyses of phosphor-bronze are recommended, namely, S. A. E. No. 65 and No. 63. The S. A. E. No. 65, called phosphor-gear bronze, has the following composition: Copper, 88 to 90 per cent; tin, 10 to 12 per cent; phosphorus, 0.1 to 0.3 per cent; lead, zinc, and impurities (maximum), 0.5 per cent. Good castings made from this alloy should give the following minimum physical characteristics: Ultimate strength, 35,000 pounds per square inch; yield point, 20,000 pounds per square inch; elongation in 2 inches, 10 per cent.

Composition for the S. A. E. No. 63 alloy, called leaded gun metal, is: Copper, 86 to 89 per cent; tin, 9 to 11 per cent; lead, 1 to 2.5 per cent; phosphorus (maximum), 0.25 per cent; zinc and impurities (maximum), 0.50 per cent. Good castings made of this alloy should give the following minimum physical characteristics: Ultimate strength, 30,000 pounds per square inch; yield point, 12,000 pounds per square inch; elongation in 2 inches, 10 per cent.

These alloys, especially No. 65, can be chilled for increasing the hardness and refining the grain. No. 65 is to be preferred for use with worms of great hardness and fine accuracy. No. 63 is to be preferred for use with unhardened worms.

(c) For bronze bushings for gears, S. A. E. No. 64 is recommended, having the following analysis: Copper, 78.5 to 81.5 per cent; tin, 9 to 11 per cent; lead, 9 to 11 per cent; phosphorus, 0.05 to 0.25 per cent; zinc (maximum), 0.75 per cent; other impurities (maximum), 0.25 per cent. Good castings of this alloy should give the following minimum physical characteristics: Ultimate strength, 25,000 pounds per square inch; yield point, 12,000 pounds per square inch; elongation in 2 inches, 8 per cent.

(d) For brass flanges for composition pinions, S. A. E. No. 40 is recommended. This is a good cast red brass of sufficient strength and hardness to take its share of load and wear under conditions of style No. 2 of the American Gear Manufacturers' Association standards for composition gearing, a design in which the flanges mesh with the mating gear and, therefore, ample for style No. 1. The composition is as follows: Copper, 83 to 86 per cent; tin, 4.5 to 5.5 per cent; lead, 4.5 to 5.5 per cent; zinc, 4.5 to 5.5 per cent; iron (maximum), 0.35 per cent; antimony (maximum), 0.25 per cent; aluminum, none. Good castings made from this alloy should give the following minimum physical characteristics: Ultimate strength, 27,000 pounds per square inch; yield point, 12,000 pounds per square inch; elongation in 2 inches, 16 per cent.

Chemical Analysis—An analysis of each melt shall be made by the manufacturer. The chemical composition thus determined shall be reported to the purchaser or his representative and shall conform to the foregoing specifications.

Sampling—(a) The sample for chemical analysis may be taken either by sawing, drilling, or milling the casting, or test coupon, and shall represent the average cross-section of the piece.

(b) The saw, drill, cutter, or other tool used shall be thoroughly cleaned. No lubricant shall be used in the operation, and the dust or metal chips shall be carefully treated with a magnet to remove any particles of iron.

Inspection—(a) Inspection may be made at the manufacturer's works where castings are made or at the point at which they are received, at the option of the purchaser.

(b) If the purchaser elects to have inspection made at the manufacturer's works, the inspector representing the purchaser shall have free entry at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the material is being furnished in accordance with these specifications. All tests and inspection shall be so conducted as not to interfere with the operation of the works.

Rejection—Castings that show injurious defects revealed by machining operations subsequent to acceptance may be rejected, and, if rejected, shall be replaced by the manufacturer free of cost to the purchaser. The full weight of the original material rejected shall be returned to the manufacturer.

* * *

THE SIXTH POWER SHOW

The sixth national exposition of power and mechanical engineering held at the Grand Central Palace, New York City, during the week beginning December 5, covered a very wide field. The number of exhibits this year was over 500, and more than 180,000 square feet of floor space was occupied. Among the different branches of mechanical engineering represented were the generation and utilization of heat and power, heating and ventilating, refrigerating machinery, power transmission, machine shop equipment, and woodworking machinery. The exhibits relating to heating and ventilating equipment and refrigeration were especially noteworthy, as over 200 of the 500 exhibits were in those fields. The exhibition was held simultaneously with the annual meeting of the American Society of Mechanical Engineers and the American Society of Refrigerating Engineers.

New Machinery and Tools

The Complete Monthly Record of New Metal-working Machinery

LANDIS AUTOMATIC FORMING AND THREADING MACHINE

An automatic machine that will accurately and rapidly produce bolts cut to length, pointed and threaded, is a recent development of the Landis Machine Co., Waynesboro, Pa. New features of this automatic pointing and threading machine insure a full thread at the start, an accurate lead, and a minimum amount of taper. The machine employs a special 3/4-inch "Landex" head, which is a revolving head of the pull-off type, equipped with Landis "Long-Life" chasers.

The machine is hopper-fed, bolt or screw blanks being shoveled by hand or dumped from a traveling bucket into the hopper. They are then delivered through a magazine to fingers which transfer them to grips in the turret chuck. An escapement is required for certain types of bolts. This attachment is incorporated in the front plate of the magazine, and can be applied to the machine at any time. The length of the finished bolt is controlled by an adjustment of the transfer bracket, this member being graduated for various bolt lengths.

The time element for the return of the forming and threading heads and the indexing of the turret chuck is constant, regardless of the diameter, pitch, length of thread, quality of material, or threading speed. The instant that the forming and threading operations are completed, an automatic accelerated motion, entirely independent of the cutting speeds, withdraws the forming and threading spindles and indexes the turret. This feature greatly increases the production. The constant time element also permits maximum speed to be used for the smaller diameters of screws and for the shortest thread without endangering the operating mechanism.

The turret chuck has three stations, one of which is used for unloading and loading work, one for cutting to length and forming the end of screws, and one for threading. These operations are performed simultaneously. An ejector is provided at the unloading and loading station to remove the bolt in case it fails to drop from the grips.

The chuck jaws open and close on a pivot that is parallel to the bolt. This important feature centralizes and squares the bolt regardless of any variation in size, and insures concentricity of the thread. It also permits long bolts to be gripped close to the portion to be threaded, without any sacrifice in the effective gripping pressure. Grips can be supplied for all bolts which the industry is called upon to make.

Screws and bolts ranging widely in diameter can be accommodated, and the machine is quickly adjusted for various diameters, lengths of thread, and lengths of bolts. One set of cams covers the entire range of the machine, and retiming or adjustment of the cams is never necessary.

The threading head is very accessible, being located at the front of the machine in full view of the operator. It is screwed on the nose of the spindle and may be quickly removed without dismounting the yoke. Change-gears permit changes in the speed of the threading head to be made in

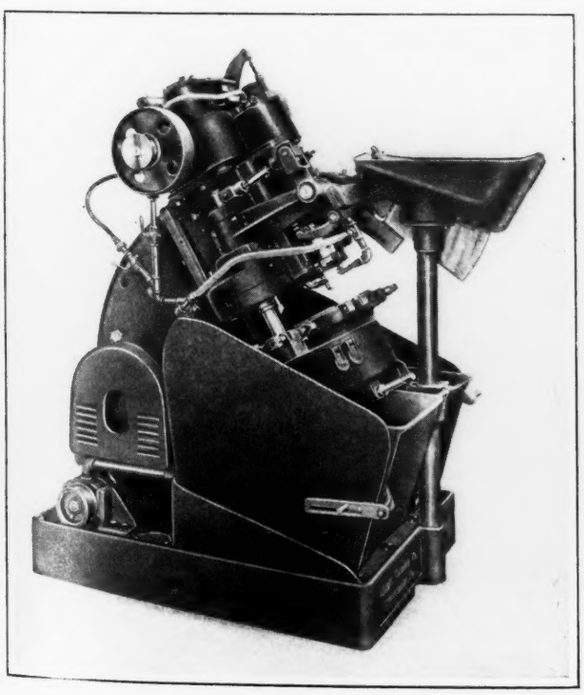


Fig. 1. Landis Automatic Forming and Threading Machine

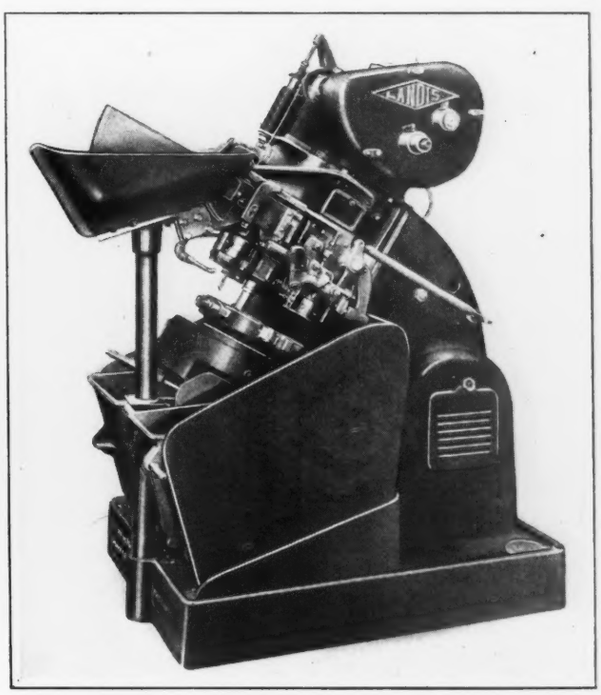


Fig. 2. Right-hand Side of Forming and Threading Machine

Fig. 3. Construction of Head Containing Threading and Forming Spindles

about two minutes, and any change in the speed of this head effects a corresponding change in speed in the forming head. The speed of the indexing mechanism, however, is constant. Automatic safety devices make it impossible for the machine to be damaged by striking any obstacle or obstruction. The safety devices are so placed that the machine functions without any retiming or adjustment after the obstruction has been removed.

The forming head is also accessible when the turret chuck is in a lowered position. It is only necessary to remove a clamping and a backing up screw to replace the pointing tool, and this can be done in about five minutes. A pointer is provided for relocating the turret chuck. The turret chuck and its operating mechanism, the Geneva indexing movement, and the lock-bolt form a self-contained unit that is fully enclosed and runs in oil. Through an elevating screw, the complete unit can be raised or lowered to suit various lengths of bolts.

The threading unit is counterbalanced; by this means, the advance of the die-head on the bolt during the threading operation is uniform and under control at all times. It insures threads that are correct in the lead. The chasers are flooded by two streams of coolant, which are delivered through the threading spindle and through a nozzle at the front of the head. The forming tool receives coolant through the forming spindle. A rotary geared pump forces the coolant to both spindles from a reservoir located in the base. Centralized lubricating systems are employed wherever possible.

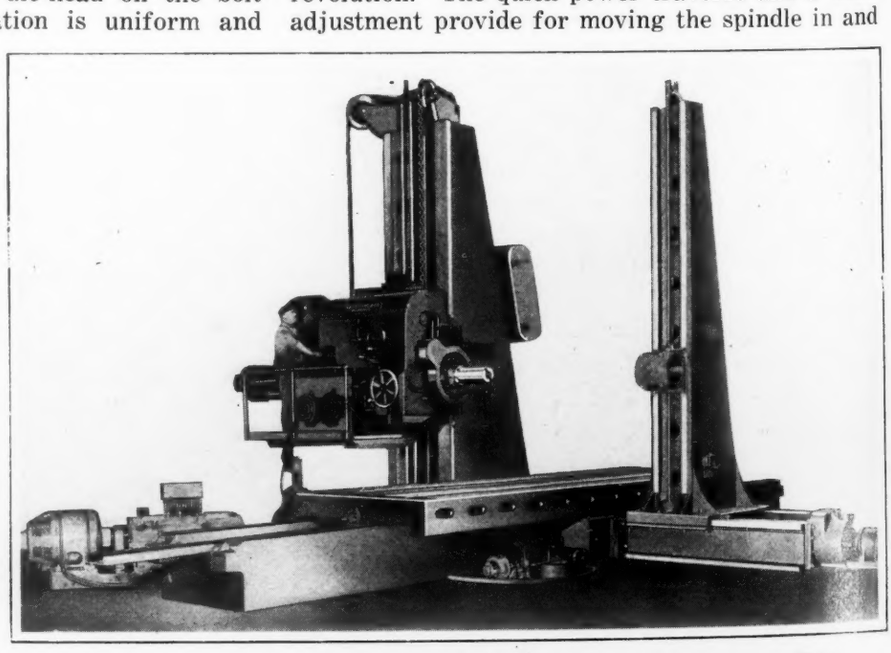
The finished bolts and the chips are collected in separate compartments, which are set at an angle so that the work and chips can be dumped into containers. When lowered, the doors form chutes to the containers. An oscillating conveyor may be employed for delivering the bolts at either the front or rear of the machine. This conveyor, which is perforated, is fitted to the bolt compartment, and has a return chute for the coolant. Other methods of delivering the finished work can be provided to suit individual handling methods and plant conditions. Either a belt or motor drive can be supplied for the machine.

SELLERS BORING MACHINE WITH PLANER-TYPE TABLE

A horizontal boring, drilling, and milling machine with a planer-type table has recently been built by William Sellers & Co., Inc., 1600 Hamilton St., Philadelphia, Pa. This is a heavy-duty machine designed to handle a large variety of work. The work-head has a spindle 7 inches in diameter, which is provided with a continuous feed of 5 feet. The travel of the head vertically is 11 feet, starting from a point 5 inches above the table top. There is a power traverse for the work-head, as well as a large series of milling, boring, and drilling feeds. Counterweights provide an easy motion of the work-head on the heavy column or upright.

The spindle rotates in a sleeve upon which the driving gear is mounted. The spindle is held in this sleeve by two bronze tapered adjustable bushings and is driven by two keys. With this construction, the spindle is free to slide in and out without the strain of driving gears, and the bronze bushings are not subjected to wear from rotation. The drive for the spindle is simple, a 15-horsepower motor, mounted directly on the work-head, being used to drive the spindle through a gear train made up entirely of spur gears. All gears and bearings are oiled from a central tank at the top of the head.

Spindle speeds from 2 to 200 revolutions per minute are obtainable by means of sliding gears and the adjustable-speed motor. Drilling and boring feeds range from 1/192 to 1 inch per spindle revolution. The quick power traverse and a hand adjustment provide for moving the spindle in and



Sellers Horizontal Boring, Drilling, and Milling Machine with Planer-type Table

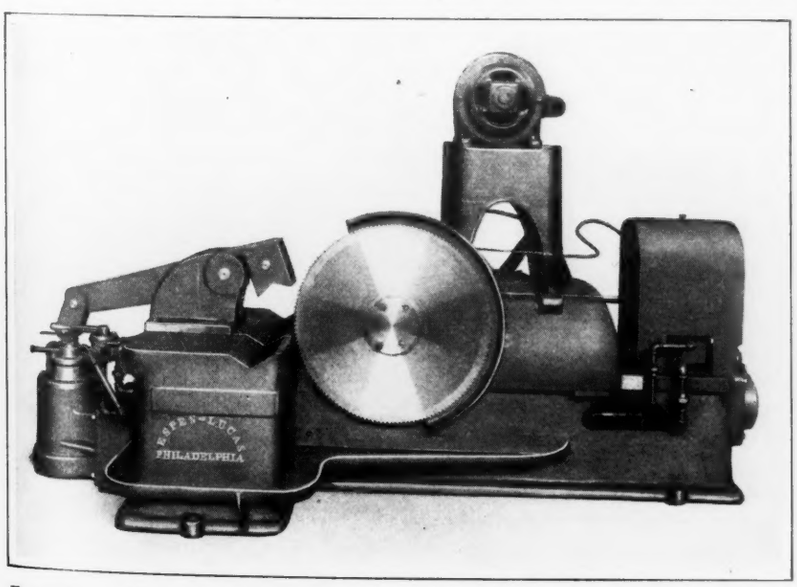
out. The same motor that drives the spindle provides the power traverse, at the rate of 7 1/2 feet per minute, and vertical milling feeds from 1/4 to 18 inches per minute.

A power traverse and milling feeds are also provided for the table, power for driving the table being derived from a 7 1/2-horsepower adjustable-speed motor which drives through the Sellers spiral-pinion and angular-rack mechanism. A gear-box at the side of the bed provides the speed changes in conjunction with the three-to-one motor. Steel herringbone gears connect the gear-box to the spiral pinion shaft.

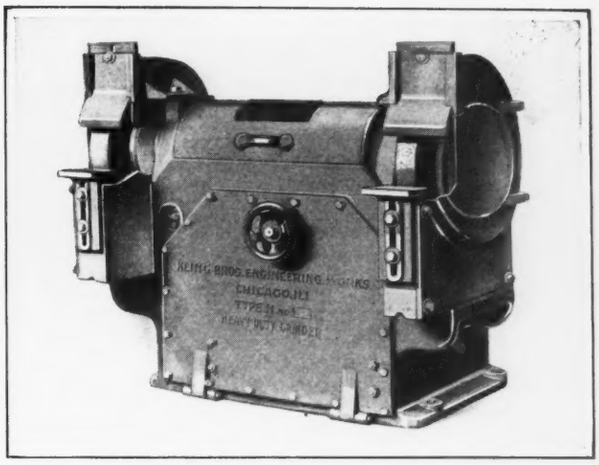
The table is 6 feet wide, 18 feet long, and has a total travel of 16 feet. It is of box section, with top and bottom plates, and is carried on one flat and one double V-way of the bed. One of the vees has the usual angle, and carries the weight of the table, whereas the other vee is above the first and its surfaces are inclined at an angle of 5 degrees from the vertical. It thus presents a practically vertical wall to oppose any side motion of the table. Holding down shoes on both sides of the table prevent it from lifting under heavy cuts when the work is high. The ways of the table and all bearings of the driving shaft are lubricated by oil fed under pressure. Other bearings, such as those of the speed-box, are oiled from a central tank by gravity feed.

The outboard support for the boring-bar travels vertically in unison with the work-head, except when milling, power being delivered to the support by a shaft which extends under the table. The upright can be moved to or from the table for various sizes of work by using a small motor to slide the upright on its separate bed.

One of the safety features of the machine is that the work-head motor is interlocked with the motor employed for feeding the table. Thus, if the work-head motor should stop, because of an overload or for any other reason, the table motor will also be shut down instantly. The table motor cannot be started until the spindle driving motor is in motion. Other safety devices include limit stops for each end of the spindle travel to protect the mechanism from accidents caused by a careless operator.



Espen-Lucas High-speed Sawing Machine with Hydraulic Table Feed and Return



Kling High-speed Heavy-duty Grinder

KLING HIGH-SPEED HEAVY-DUTY GRINDER

A type N heavy-duty grinder is now being manufactured by the Kling Bros. Engineering Works, 1300-1332 N. Kostner Ave., Chicago, Ill. This machine is equipped with three speed pulleys, which permits keeping the wheel speed constant at a high rate. The machine may be employed for grinding gray iron, malleable-iron and steel castings; iron and steel forgings; and parts made of other materials. It may be used on production work requiring a good commercial finish and for snagging or rough-grinding. Easy adjustments are provided.

ESPEN-LUCAS SEMI-AUTOMATIC PRODUCTION SAWING MACHINE

A semi-automatic production cut-off saw, designed not only for fast sawing, but also for the quick handling of material and the machine between saw cuts, is the latest addition to the line of machine tools built by the Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa. The machine has been brought out expressly for cropping off the ends of cast solid and tube billets and for sawing the billets to length. This machine has supplied a sufficient quantity of billets to an extruding mill that required two billets per minute. In this work, the machine sawed through 7-inch solid billets in seven seconds, three seconds only being allowed for clamping and unclamping.

There is a quick-feed traverse to the saw carriage and a quick return through an Espen-Lucas low-pressure oil-feed system. The quick-acting clamp may be operated either by air or oil pressure. Complete controls are provided at one end of the table. Material may be passed from the machine without a workman touching it. Either a direct- or alternating-current motor can be furnished and, according to the characteristics of the metal to be cut off, the motor may be of the constant-, multi- or variable-speed type.

BLISS HIGH-SPEED PUNCH PRESS

Three hundred strokes are made per minute by a new type of press recently developed by the E. W. Bliss Co., Brooklyn, N. Y. This machine is designed particularly for punch press work involving large quantity production runs. Fundamental principles embodied in the design contribute to increase materially the number of punchings obtained per grind of the die used, and hence increase the total life of the die. The machine is intended for only one class of work, largely blanking.

The press is built with a heavy frame that is keyed in alignment and tied together with oversized tie-rods. These rods are "shrunk in" on the housings under an initial tension in excess of the rated machine load. The eccentric-type shaft is supported up to the crankpin and, it is claimed, the frame, bed, crown and shaft cannot spring. Substantial sub-presses, with hardened and ground pins and bushings, insure accurate alignment.

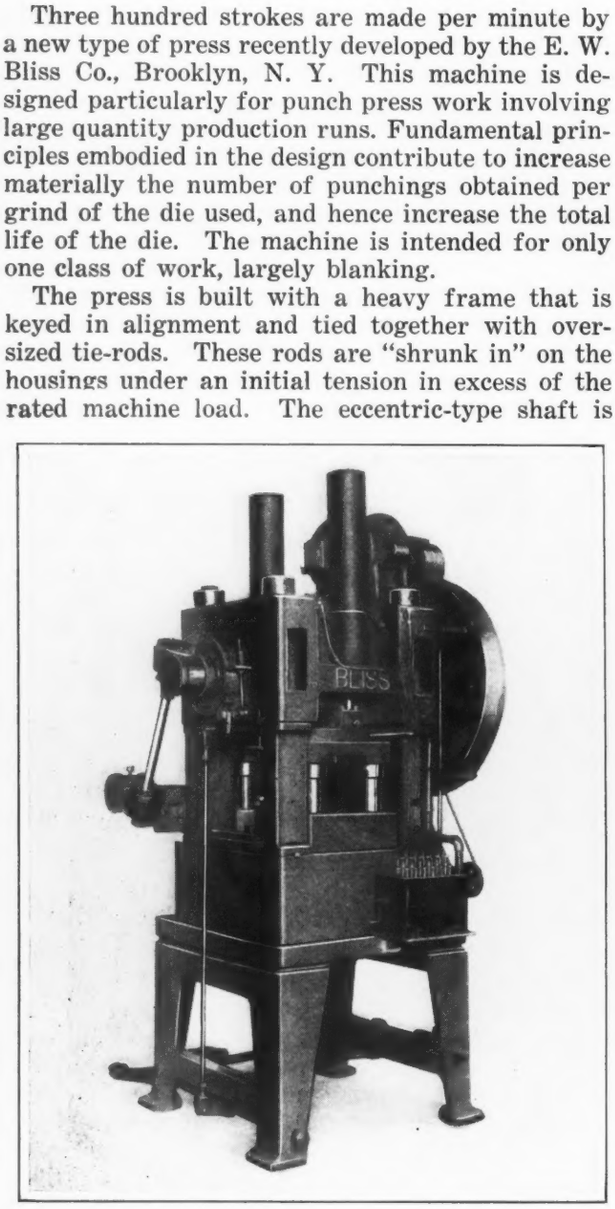


Fig. 1. Bliss Punch Press which Operates at 300 Strokes per Minute

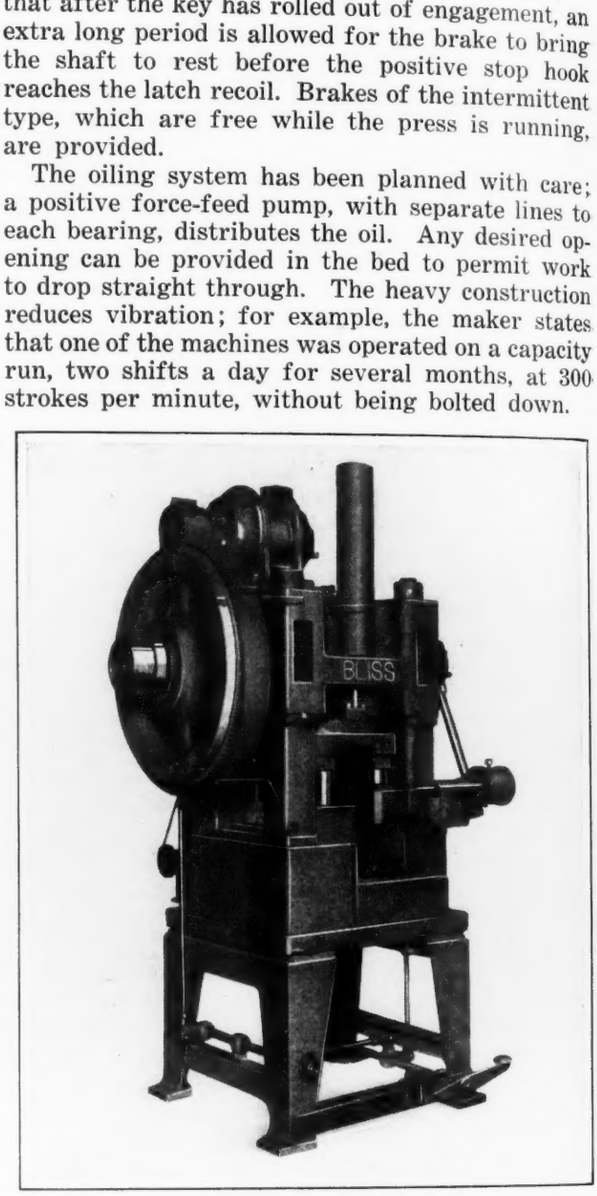


Fig. 2. Rear View of Punch Press Showing Lubricating System

The stroke of the press is short to keep down the working velocity of the punches. All moving parts are compact, and their weight is counterbalanced by long compound springs. The distance from the face of the slide to the center line of the crankshaft is unusually short. Large adjustment of the press is not required; an adjusting wedge which permits ample adjustment is controlled by a screw having a disk that is graduated to facilitate fine settings.

While some Bliss high-speed presses are built without clutches and others use pin and expanding friction clutches, most of them are fitted with the Bliss high-speed rolling-key clutch. In this clutch, long and completely backed-up surfaces of a rolling key are brought into engagement with the wheel bushing at a slow lineal velocity due to the closeness of the key to the center line of the shaft. Special long hook clutches and latches are provided, so that after the key has rolled out of engagement, an extra long period is allowed for the brake to bring the shaft to rest before the positive stop hook reaches the latch recoil. Brakes of the intermittent type, which are free while the press is running, are provided.

The oiling system has been planned with care; a positive force-feed pump, with separate lines to each bearing, distributes the oil. Any desired opening can be provided in the bed to permit work to drop straight through. The heavy construction reduces vibration; for example, the maker states that one of the machines was operated on a capacity run, two shifts a day for several months, at 300 strokes per minute, without being bolted down.

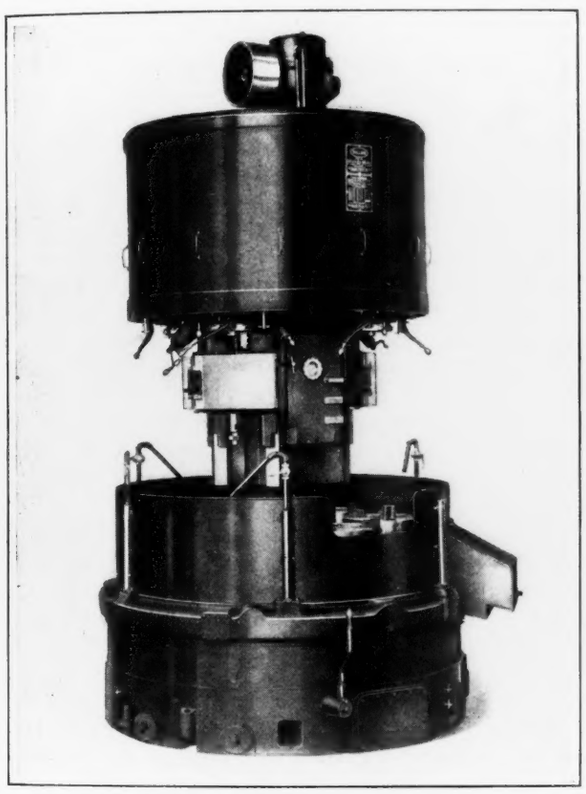
Mechanical feeds of several types can be furnished, including single- and double-roll feeds driven continuously or intermittently, magazine feeds, etc. The illustrations show a press equipped with a continuously operating single-roll feed driven through spiral gears and also equipped with a modified flying stop gage.

BULLARD "MULT-AU-MATIC"

A 20-inch six-spindle "Mult-Au-Matic" has recently been added to the line built by the Bullard Machine Tool Co., Bridgeport, Conn. Six-spindle models of this machine are now built in 8-, 12-, 16-, and 20-inch sizes, and four-spindle models, in 6- and 8-inch sizes. The latest size extends the application of the "Mult-Au-Matic" method to larger work in which there are fewer opportunities for identical continuous production, but in which economy may be derived by using the machine for shorter runs and more frequent changes of set-up.

The machine provides a clear swing of 21 1/2 inches in diameter for a distance of 8 inches above the chuck face, and 12 inches in diameter for chucked work extending 17 inches high. As in the other machines of the same type, the work is chucked by the operator at the loading position, is periodically indexed through each of five working stations for the respective operations, and is finally returned to the first station for unloading. Six pieces are usually in process at the same time.

At the loading station there is a power-driven chuck-operating unit, which connects with the respective spindles as they are brought to this station and drives the mechanism provided in each spindle to actuate the standard three-jaw chuck. This unit



Bullard 20-inch "Mult-Au-Matic"

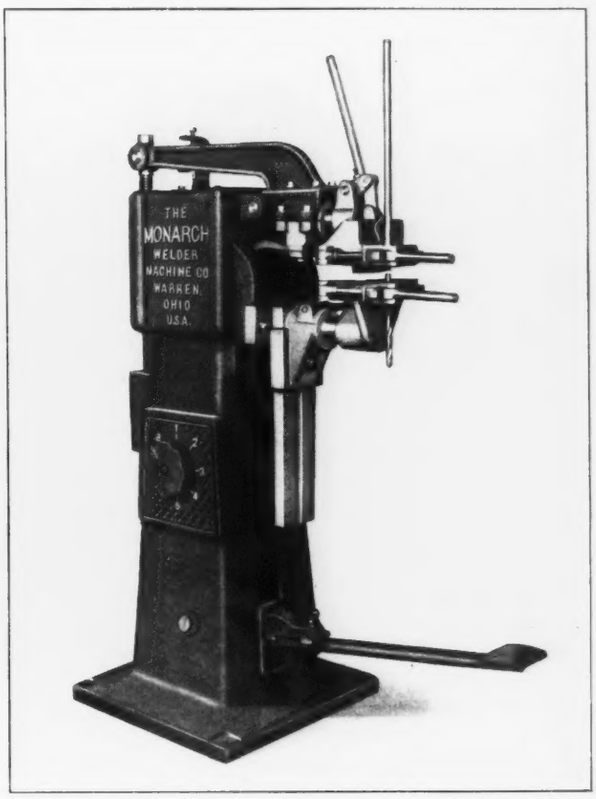
may also be used to operate special work-holding devices attached to the face of the spindles. The tool-heads at the five working stations may be of plain, compound, standard universal, or double-purpose type, providing vertical, horizontal, or angular movements, or a combined vertical and horizontal tool traverse and feed.

Twenty-five spindle speeds, ranging from 5.3 to 131.7 revolutions per minute may be obtained independently at each station. Nineteen tool feeds, ranging from 0.0033 inch to 0.1294 inch per revolution, are independently variable for each head. This arrangement provides the proper feed and speed required by the particular operation at each station of the machine. Either a direct motor drive or a belt drive can be furnished. The average power demand under a normal load requires a 15-horsepower motor, which may be mounted on top of the machine. A main-clutch control lever is provided at each station, and all tool-heads may be operated independently by hand or power.

MONARCH BUTT-WELDING ATTACHMENT

A vertical butt-welding attachment has been placed on the market by the Monarch Welder Machine Co., Warren, Ohio, for use with the "Little Giant" spot-welder built by the same concern. This attachment is composed of two principal units, an upper and a lower, which are mounted on two copper arms of the same diameter as the regular spot-welding horns. To change the machine from a spot-welder to a butt-welder, it is only necessary to loosen four bolts on the upper spot-welding horn and one on the lower, remove the horns, and insert the butt-welding attachment.

The upper unit operates on a slide, which moves up and down and is controlled by a counter-



Monarch Welder with Butt-welding Attachment

weighted lever to bring the two parts to be welded into contact with each other. A set-screw can be set as a stop to form an upset weld. When the machine is being used as a butt-welder, the foot-lever is employed for actuating the switch only.

In operation, the work to be welded is clamped in the upper and lower welding dies, the parts are brought into contact by means of the hand-lever at the right, and finally, the foot-lever is manipulated to operate the switch. Interchangeable copper dies are used, being made for flat, round, or angular stock as required.

NORTON HYDRAULIC SURFACE GRINDING MACHINE

Hydraulic traverse of the table is the principal feature of a new model open-side surface grinding machine recently brought out by the Norton Co., Worcester, Mass. Another feature is that two lengths of tables can be furnished. The machine

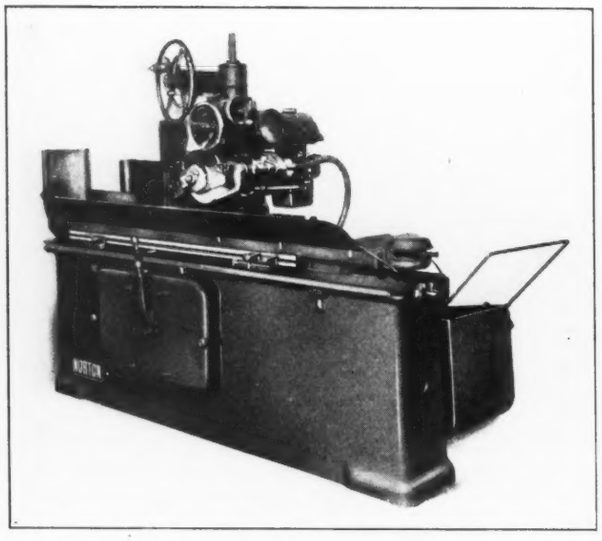


Fig. 1. Norton Open-side Surface Grinding Machine with Hydraulic Table Traverse

is built on a new and longer base than that of the previous open-side machine, the base being the same length at the floor as at the table ways. One of the tables provides for grinding work up to 36 inches in length, and the other, up to 48 inches in length. Finished pads on the top surface of the table have machined T-slots in them, which permit the convenient mounting of magnetic chucks for work of the lengths mentioned.

The hydraulic mechanism for traversing the table is entirely enclosed within the base, but it is easily accessible for adjustment through two doors at the front of the machine. All movements of the table are controlled by the two levers seen between the base doors. The upper lever is used for reversing the table motion either by hand or automatically at the end of the stroke.

Two dogs are provided at the right-hand end of the table, one for conveniently setting the stroke to correspond with the length of work being ground, and the other to serve as a stop for locating the table relative to the grinding wheel for truing. By pulling the reverse lever out toward the operator, the first dog may be passed, but the lever is tripped by the second dog.

The lower lever controls the speed of the table traverse through a valve, and can also be used for stopping the table motion, although by moving the reverse lever to the central position this is accomplished without disturbing the setting for the table speed desired. Table speeds for grinding can be varied from 30 to 90 feet per minute. Smooth reversal of the table at high speeds is accomplished through air cushions connected with the hydraulic system.

Many features of the older machine are retained, including the flood-lubricated grinding wheel spindle with bearings that are adjustable while the spindle is running. Cross-feed of the wheel-slide is obtained by means of two handwheels, one of which is used for regular operation and the other to impart a slow motion while truing. The vertical wheel feed with graduations to 0.00025 inch is retained. The general appearance of the machine has been improved by the new base design and the simplicity of table controls. Splash guards are furnished for the table.

A standard 15-horsepower constant-speed motor bolted to the rear of the base furnishes power for both the spindle and the hydraulic table traverse. The standard grinding wheel used is 10 by 3 by 3 inches. The weights of the machine are 7300 and 7400 pounds, respectively, for the two table lengths, and the projected floor space occupied is 12 and 13 feet long, respectively, by 64 inches deep. The length of the base with either table is 8 feet.

SOCIETE GENEVOISE DIAL GRADUATING MACHINE

A high-speed machine which was recently produced by the Société Genevoise d'Instruments de Physique, Geneva, Switzerland, and is now being introduced on the American market by the R. Y. Ferner Co., Investment Bldg., Washington, D. C., is adapted to the ruling of cylindrical pieces, flat disks, beveled plates, dials, etc., at speeds ranging as high as 100 lines per minute. The machine constitutes a new model of the No. 0065 machine, and is given the additional designation of "Model 1927." The new model is built for greater speed than the previous one, and is arranged for tilting the work through 90 degrees instead of tilting the tracing tool in order to graduate beveled dials of various angles. The tracelet works at all times in a horizontal position on top of a vertical column. This column may be adjusted up or down or along the bed, according to the size of the work.

The worm which drives the toothed dividing wheel is enclosed in a housing which can be tilted to various angles from the horizontal to the vertical, the angle of the position being read on a quadrant graduated in degrees. Ratchet wheels permit the spacing of lines at practically any desired interval from 2 minutes to 6 degrees. Various notched disks and ratchet wheels are also provided for the tracelet to give any desired combination of lengths of lines in the binary, decimal or duodecimal systems, while special wheels and disks can be furnished to meet unusual requirements.

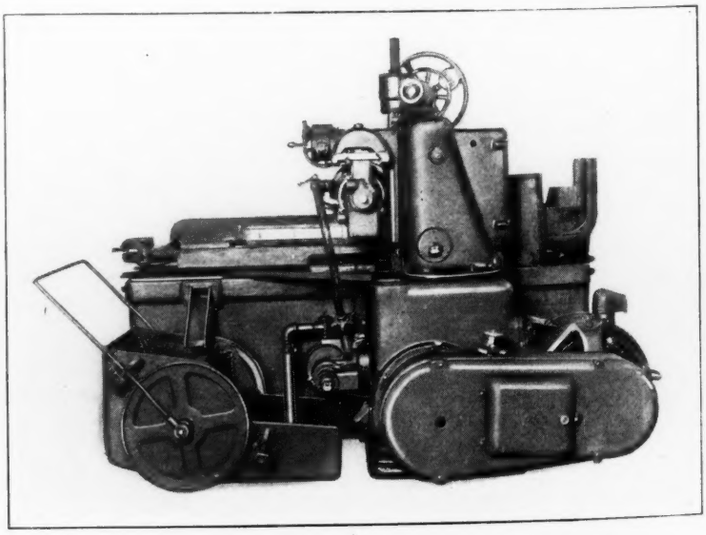
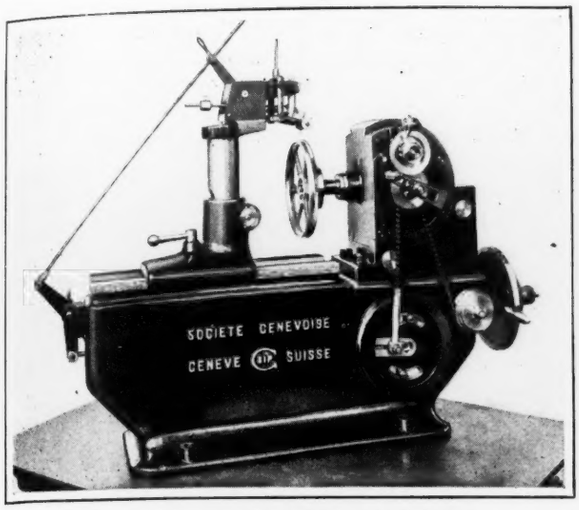


Fig. 2. Rear View of Hydraulic Surface Grinding Machine



Societe Genevoise Dial Graduating Machine

The machine is driven by a small motor through a four-step grooved pulley and round belt. Starting and stopping are controlled by a hand-lever. The work may be held in chucks or on mandrels. Cylindrical work up to 10 5/8 inches in diameter by 5 1/2 inches long can be graduated, as well as flat disks up to 20 7/8 inches in diameter by 2 inches thick, and dials beveled at 45 degrees, up to 6 11/16 inches in diameter. The machine weighs approximately 345 pounds.

BEATTY COPING MACHINE

Four cutting dies are provided on the turret head of a "four-in-one" coping machine recently developed by the Beatty Machine & Mfg. Co., Hammond, Ind. Most of the mechanism of this machine which is visible in the illustration is set in a pit, with only the turret head extending above the floor. The pit is then boarded over. The turret head is revolved to permit ready use of any of the cutting dies. Both ends of an I-beam or channel-iron can be conveniently cut without turning the work end for end from right to left or vice versa, as it can be passed across the machine. Heavy work can be supported on roll feeds or by other suitable means.

The machine is built in several sizes to meet individual conditions. A No. 2 coper is illustrated; the No. 1 head of this machine will handle from 2- to 8-inch channel-irons or from 3- to 9-inch I-beams; the No. 2 head, from 9- to 12-inch channel-irons or from 9- to 12-inch I-beams; and the No. 3 head, from 12- to 18-inch channel-irons or from 14- to 24-inch I-beams. The No. 4 head will cut the webs of all channel-irons or I-beams within the range mentioned.

PREST-O-LITE BLOW-TORCH

An outfit by means of which the oxy-acetylene flame may be used in many industrial heating applications, such as soldering, brazing, and removing paint, has been placed on the market by the Prest-O-Lite Co., Inc., 30 E. 42nd St., New York City. This equipment consists simply of a light blowpipe handle and a set of special tips which give flames suitable for a wide range of work. The outfit is most conveniently employed with a small gas tank of the type used on a motorcycle or truck, together with 6 feet of hose.

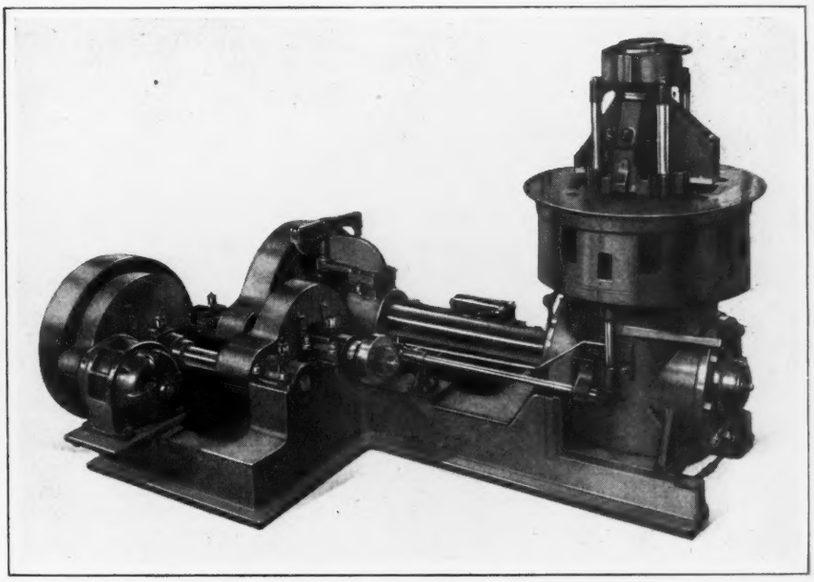
An advantage of this equipment is its portability. It can be placed in action immediately as no preheating is required, it only being necessary to turn on the gas and light the torch. The gas can be turned off between jobs. Soldering may be done with one of the tips or the blowpipe may be converted into a soldering iron by slipping the soldering copper over the blow-torch tip and tightening a set-screw.

GORTON CUTTER GRINDER

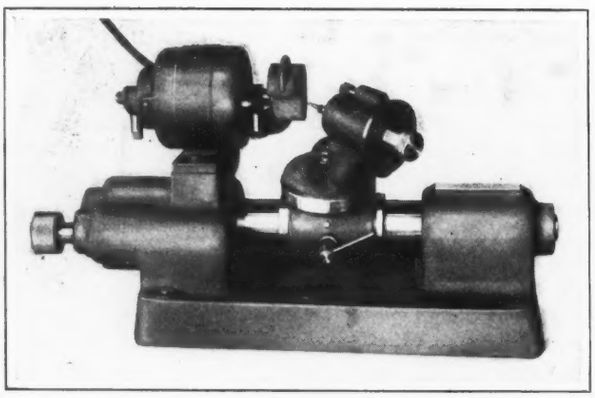
The universal cutter-holding head on the latest cutter grinder to be brought out by the George Gorton Machine Co., Racine, Wis., adapts this machine for grinding many types of cutters with various angles and reliefs. This machine is especially suited for grinding engraving machine cutters, small milling cutters, and small drills.

The wheel mount consists of a completely enclosed motor with the wheel mounted direct on the armature shaft. Either a 1/8- or a 1/6-horsepower motor can be furnished. The 1/8-horsepower motor runs at 5000 revolutions per minute, is equipped with plain bearings and a special spindle for taking up end thrust, and is recommended for the smaller class of work. The 1/6-horsepower motor runs at 3400 revolutions per minute, and is equipped with magneto-type ball bearings which may be adjusted for wear. The standard wheel for the 1/8-horsepower motor is 2 1/8 inches in diameter, 1 1/4 inches thick, 3/8 inch face width, and has a 5/8-inch hole. The wheel for the 1/6-horsepower motor is 4 inches in diameter, 1 1/4 inches thick, 1/2 inch face width, and has a 5/8-inch hole.

A particular feature of the machine is the construction of the telescope sleeve which carries the universal head, and the construction of the feed-screw that provides longitudinal adjustment of the



Beatty Coping Machine with Revolving Turret Head



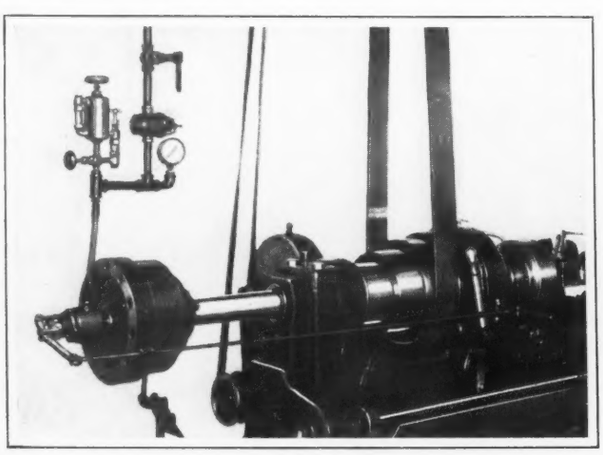
Gorton Cutter Grinder for Small Tools

head. The knurled head seen at the left-hand end of the machine is rotated to actuate the feed-screw. The universal head is adaptable to a variety of uses. It is mounted on a swinging bracket and may be swiveled on this bracket to any desired position, as indicated in degrees. It is clamped in the desired position by means of the tail nut on top. Four styles of universal heads can be furnished.

HOPKINS AIR CYLINDER EQUIPMENT

Equipment which simplifies the construction and control of the cylinder used to operate the Hopkins air chucks manufactured by the Tomkins-Johnson Co., 617 N. Mechanic St., Jackson, Mich., has recently been developed by this concern. This new equipment does away with the need for carrying two air lines to the operating valve on a machine tool. Instead, the valve is located immediately at the rear of the cylinder as illustrated, and is manipulated by a lever at the operating position of the machine. This lever is connected to the valve through a long rod and link.

The valve consists of a sliding member which is operated to admit air for the forward and return strokes of the piston in the cylinder. The construction of the piston has also been improved through the application of a box design, which affords economy in the amount of air used. A self-sealing packing effectively prevents air leakage. This packing is held tight through air pressure without the use of nuts. In addition to the parts mentioned, the illustration also shows a pressure gage, reducing valve, cut-off valve, and lubricator.

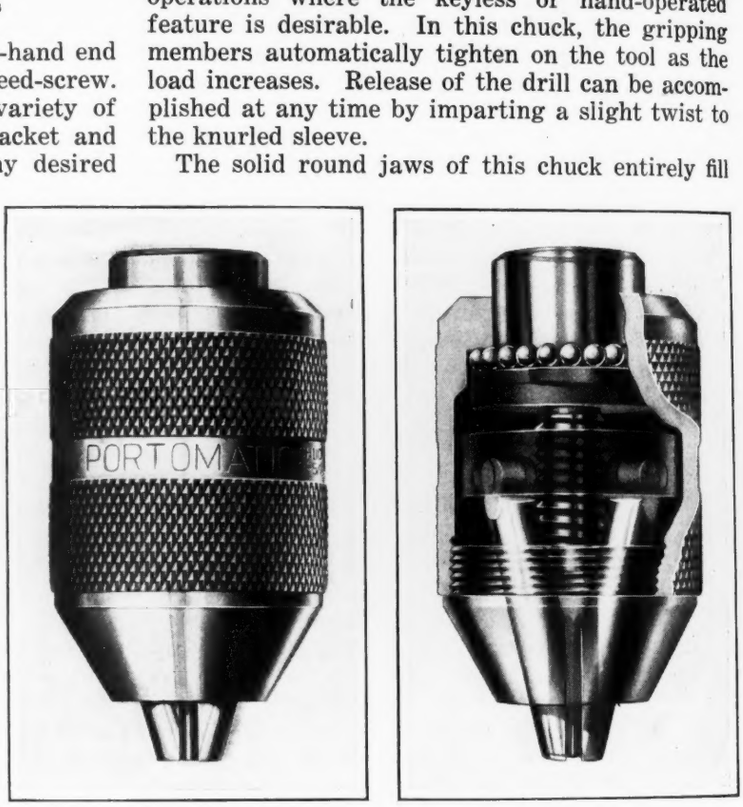


Hopkins Improved Air Cylinder Equipment

JACOBS "PORTOMATIC" AND PLAIN-BEARING CHUCKS

An automatic self-tightening chuck known as the "Portomatic" has recently been brought out by the Jacobs Mfg. Co., Hartford, Conn., particularly for application to portable drills and for use in drilling operations where the keyless or hand-operated feature is desirable. In this chuck, the gripping members automatically tighten on the tool as the load increases. Release of the drill can be accomplished at any time by imparting a slight twist to the knurled sleeve.

The solid round jaws of this chuck entirely fill the holes in which they are contained, and thus prevent the entrance of dirt or chips into the interior of the chuck. Lateral movement of the jaws is controlled by a simple means which insures freedom of operation. A ball thrust bearing eliminates friction during the tightening and loosening operations. Models of this chuck with either a taper or threaded hole are made in four sizes to accommodate drills from 0 to 1/2 inch.



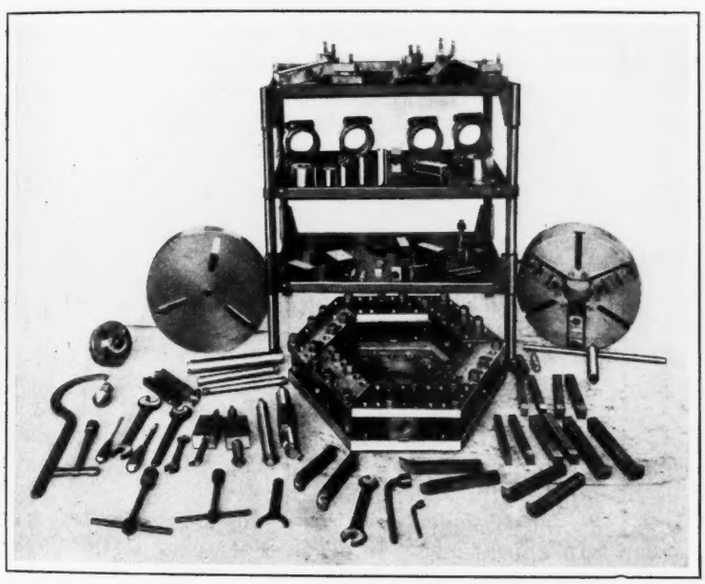
Jacobs "Portomatic" Self-tightening Chuck

A new model has also been added to the line of improved plain-bearing chucks made by the same company. This No. 36 model has a capacity for drills from 3/16 to 3/4 inch, is 3 1/4 inches outside diameter, and weighs 2 pounds 12 ounces. This chuck is also particularly suitable for use with portable drilling equipment, and can be furnished with either a taper or threaded hole for mounting directly on drill spindles, or with a Morse taper shank to fit the socket of drill spindles. With this new chuck model, straight-shank drills and reamers or the straight spindles of honing devices can be held, thus increasing the usefulness of the portable drill upon which the chuck is mounted.

CHUCKING OUTFIT FOR HARTNESS FLAT TURRET LATHES

A revised chucking outfit for all Hartness flat turret lathes—12-, 15- and 17-inch sizes—is being introduced to the trade by the Jones & Lamson Machine Co., Springfield, Vt. In designing this outfit, it was the aim to produce a standard tool equipment which would be sufficient for the general run of work that comes to the ordinary turret lathe, so that the purchaser of a chucking turret lathe would be able to use the machine immediately upon its arrival without investing in any additional or special tools. There is a sufficient number of tools in the outfit to allow an unusual degree of multiple tooling on complicated work.

The forged tools supplied are made in larger sizes than before, while the tool-holders are of a new and rigid design and utilize standard tool bits. On the 12- and 15-inch machines, and on the 17-inch machine equipped with a round turret, the tool plate is now made in one large ring as illustrated, rather than in sectors as previously. This construction makes for increased rigidity in tool mounting. However, for combination bar and chucking work and for cases where special tools are to be used, the six-part segments will be supplied.

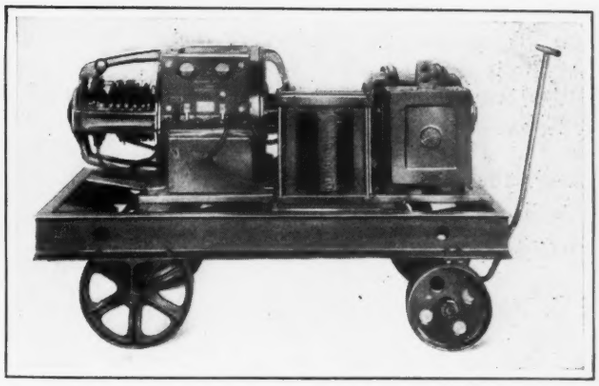


Standard Chucking Outfit Supplied with Hartness Flat Turret Lathes

GENERAL ELECTRIC SINGLE-OPERATOR WELDER

A new single-operator welder which is rated to deliver 300 amperes is being placed on the market by the General Electric Co., Schenectady, N. Y. This machine includes a four-bearing, ball-bearing motor-generator set with a flexible coupling. One of the features of the outfit is that a rapid and simple inter-change of motors can be made by the user. As a result, inspection, maintenance, renewals, and changes necessitated by changes in the supply circuit are simplified.

The driving motor is of 15-horsepower capacity. The generator is designed for a belt, motor, or engine drive, and for either stationary or portable use. This equipment can be used both for manufacturing or repair work in foundries, steel mills, locomotive and car shops, shipyards, general machine shops, etc.



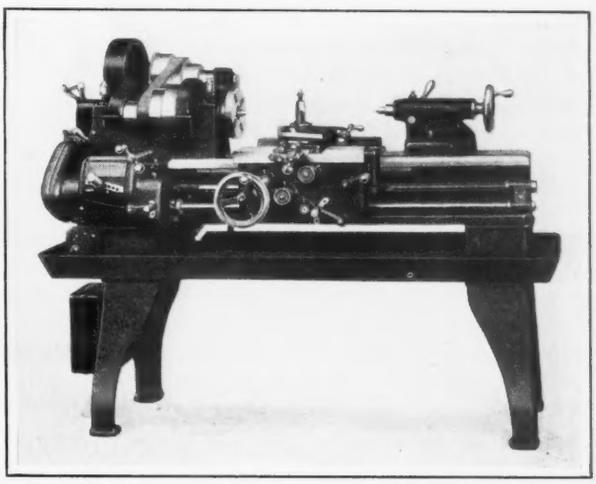
General Electric Single-operator Welder

ROCKFORD MOTOR-DRIVEN CONE-HEAD LATHES

Cone-head lathes with individual motor drives are now being placed on the market in 12- and 14-inch sizes by the Rockford Machine Tool Co., 2400 Kishwaukee Rd., Rockford, Ill. These lathes are of a small heavy-duty type, and are designed for rapid production in manufacturing departments. They are also particularly suitable for use in vocational schools, because even though the lathes are motor-driven, the student can be taught how to shift belts and solve problems in ratio through the steps of the cone pulleys.

Either a direct- or alternating-current motor can be used. It is mounted at the rear of the bed on a bracket supported from the finished top of the bed. A push-button control is provided. There is also an electrical reverse drum through which the direction of spindle rotation can be quickly reversed by operating a button. A simple means of adjusting the tension of the cone pulley belt is furnished.

A quick-change box gives thirty-two changes of

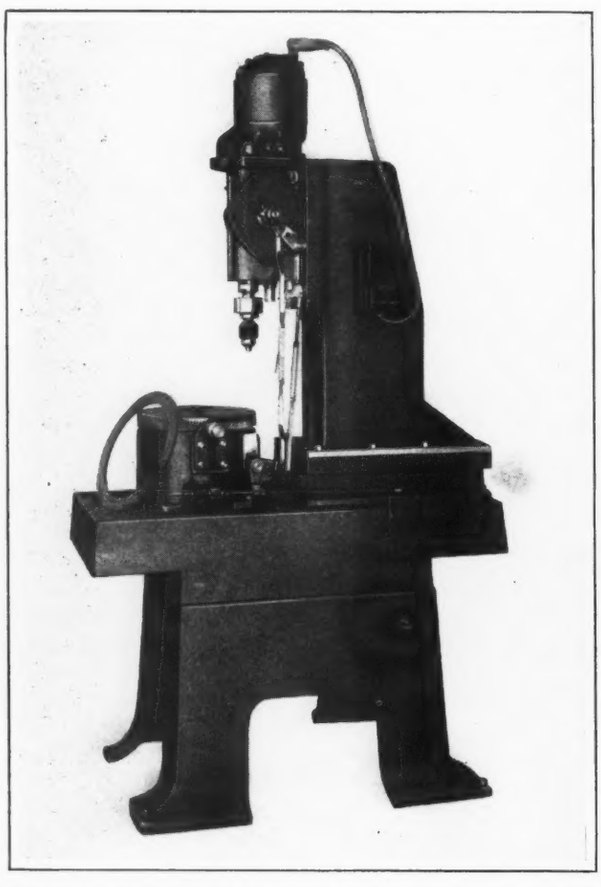


Rockford Cone-head Lathe with Motor Drive at Rear

feeds and threads. On the 12-inch machine, eight spindle speeds, ranging from 9 to 465 revolutions per minute are obtainable, and on the 14-inch machine, nine speeds from 20 to 435 revolutions per minute. The actual swing on the 12-inch machine is 13 1/16 inches, and on the 14-inch machine, 14 5/8 inches.

MILLHOLLAND AUTOMATIC INDEXING DRILLING MACHINE

A machine in which the work is indexed automatically for drilling a series of holes about circles, has recently been built by the Millholland Sales & Engineering Co., 230 S. Pennsylvania St., Indianapolis, Ind. The illustration shows this machine set



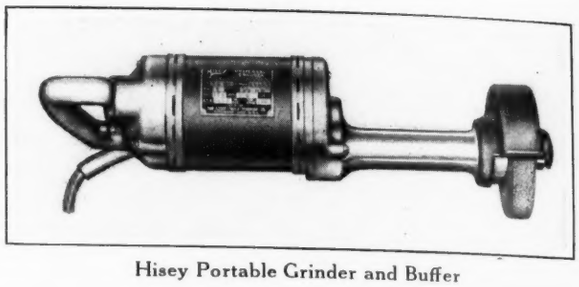
Millholland Drilling Machine which Indexes Automatically

up for drilling 130 pairs of holes around a gas ring, but by using different indexing rings, the machine can be readily made to index for various jobs. The upright on which the spindle head is mounted is adjustable in and out so that holes can be drilled at various radii from the center of work.

The machine is so arranged that the drill head automatically repeats its cycle a given number of times and then the feed is disengaged. The operator places a piece of work in the machine and starts it in motion, after which he can attend other machines until the operation is completed and the machine again stops. The drill head follows the construction described in June MACHINERY.

HISEY PORTABLE GRINDER AND BUFFER

A 1/2-horsepower portable grinder and buffer equipped with a ball-bearing motor and a roller-bearing grinding spindle is being introduced to the trade by the Hisey-Wolf Machine Co., Cincinnati, Ohio. This tool has a new two-pole switch that is conveniently controlled at the grip handle.



Hisey Portable Grinder and Buffer

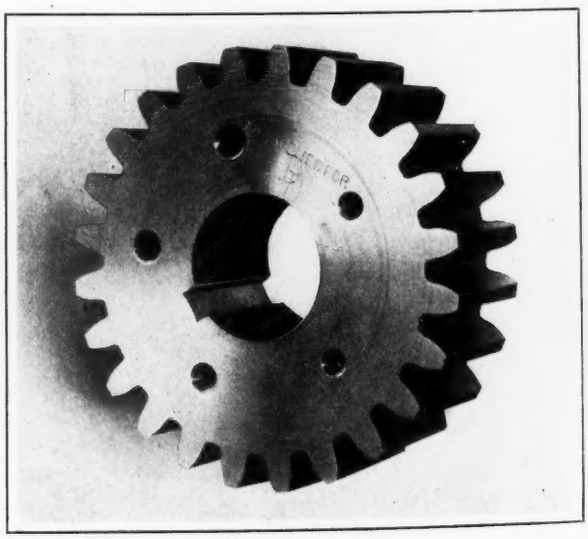
The motor is of the Hisey single-purpose type, and is of universal design for operation on direct current or single-phase alternating current of the same voltage. The wheel guard is a steel casting, and can be adjusted to any angle most convenient for the operator. The end cover is readily removed, affording quick replacement of grinding wheels. A wheel 5 inches in diameter by 3/4 inch thick is employed. Equipped with the steel guard, this tool weighs approximately 23 pounds.

ALL-METAL SILENT GEARS

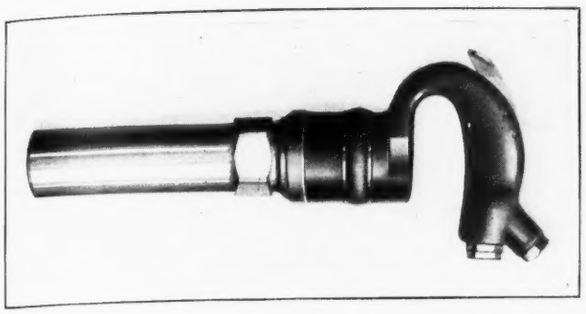
A line of all-metal silent gears has been developed by the Flexible Engineering Corporation, 10 E. 43rd St., New York City. These "Double-D" gears are self-lubricating. They are designed to prevent tooth breakage and to increase the life of silent gears and pinions by giving them the strength and life of steel.

The gears are intended for use wherever noise is objectionable, and especially where strenuous service is required of them. They operate silently in mesh with each other or in mesh with metal gears of ordinary construction. Their silent operation is due to the special construction.

The finished gear resembles a ground steel gear in appearance. In service, the gear teeth take on a glass-like surface which diminishes friction. The shrouds are made of the same silent, steel, self-lubricating construction as the gear unit proper. Gear blanks of this construction can be easily cut.



All-metal Silent Gear Made by the Flexible Engineering Corporation



High-speed Chipping Hammer Made by the Cleveland Pneumatic Tool Co.

"CLECO" CHIPPING HAMMER

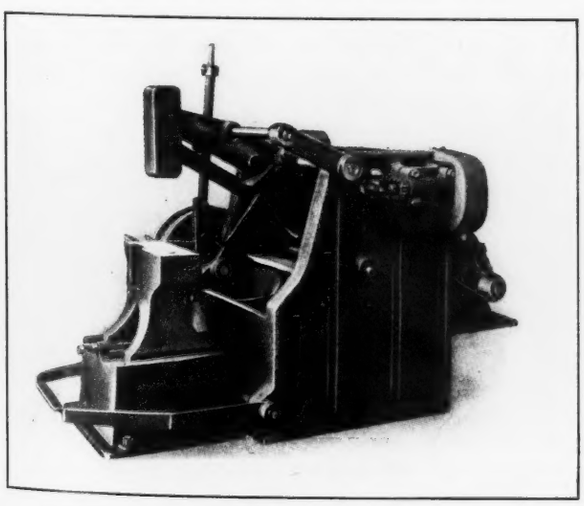
A pneumatic high-speed chipping hammer is being introduced on the market by the Cleveland Pneumatic Tool Co., Cleveland, Ohio. This "Cleco" hammer has a throttle valve of the two-stage type which graduates the air supply and regulates the force of the blow. There is a graduating apron at the front of the valve so tapered as to allow the air to pass into the hammer gradually. As the thumb latch is depressed, the movement of the piston is gradually accelerated until the maximum speed and power of blow is reached, thus eliminating all recoil or vibration in action.

At the forward end, the cylinder is reinforced by a tapered retaining wall, and the piston is tapered correspondingly, which eliminates cylinder breakage at this point. The handle of the tool is drop-forged, and made with either the clamp-bolt lock or the ratchet lock. The handle may be either open or enclosed, with the outside latch.

CHAMBERSBURG MECHANICAL SLEDGE

A mechanical sledge or smithing hammer which differs somewhat from the one described in June, 1926, MACHINERY, has recently been designed by the Chambersburg Engineering Co., Chambersburg, Pa. The traverse of the new hammer is controlled by a lever instead of by the foot, the up and down movements of the hammer and the force of the blow only being foot-controlled. Heavier construction of various parts has also been adopted to enable the machine to withstand severe usage.

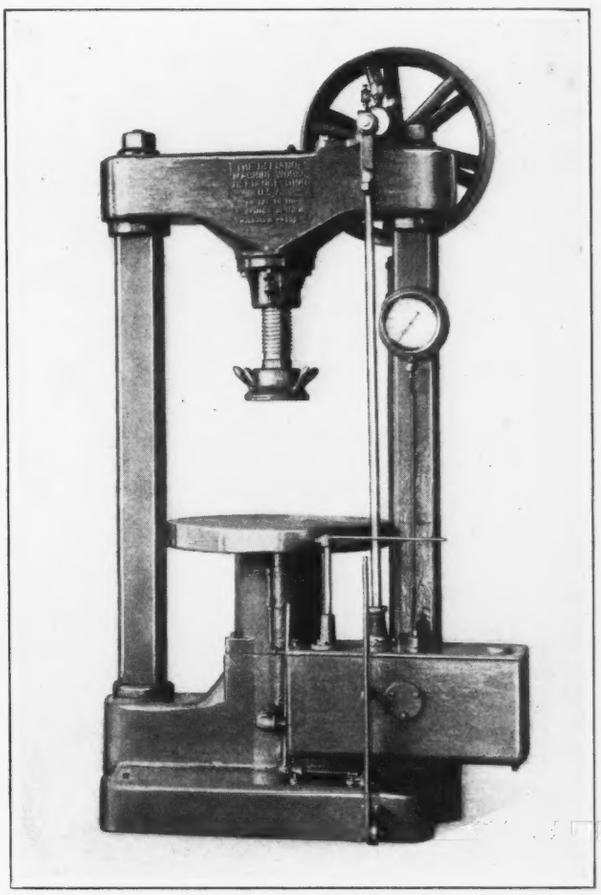
In operating this equipment, the smith has both hands free and is relieved of the labor of hammering. The hammer can be made to strike on any part of the anvil without interrupting its operation, and the hammer face is always parallel with the face of the anvil. The weight of the equipment complete with the motor is approximately 4500 pounds.



Chambersburg Mechanical Sledge or Smithing Hammer

DEFIANCE HYDRAULIC PRESS

A vertical 60-ton hydraulic press, designed for general-purpose use in pressing objects together in automobile plants, wheel plants, and other shops where a ram stroke not exceeding 8 inches is required, is being placed on the market by the Defiance Machine Works, Defiance, Ohio. This No. 727 press has a frame consisting of a heavy



Defiance 60-ton Hydraulic Press

cored base, a cross-head, and two square columns, all of which are cast from semi-steel.

The cross-head supports the drive mechanism, and is fitted with a square-thread screw 4 inches in diameter having a travel of 22 inches. The lower end of the screw is provided with a pressure block or head 8 inches in diameter, which has handles for up and down adjustment. The maximum distance from the top of the table to the under side of the screw head is 22 inches, and the distance between columns is 29 1/2 inches. The working surface of the table top measures 28 inches in diameter. A binder provides for locking the screw in place after it has been properly adjusted.

The hydraulic pump is of the double-acting type, and is located in a cast-iron tank fastened to the base. This tank is dustproof and serves as a container for the oil used to force the ram. A pressure

gage registering up to 60 tons indicates the exact pressure being applied at all times. An adjustable safety valve attached to the pump can be set to release the force at any desired pressure within the given capacity.

The ram is 8 inches in diameter and is fitted in a cylinder that is cast integral with the base. The maximum vertical ram movement is 8 inches. With a motor drive, a 5-horsepower motor is required. The net weight of this machine is approximately 3500 pounds.

HALL-PLANETARY MAGAZINE FEED

A hopper feed attachment has been brought out by the Hall Planetary Co., Fox St. and Abbottsford Ave., Philadelphia, Pa., for automatically conveying work pieces to "Planetary" machines for performing threading and bore-finishing operations by the method known as "Planamilling." This attachment is especially useful for feeding such forged or cast parts as small pipe unions, couplings, valve bodies, ells, tees, bushings, pipe flanges, etc., that belong to the "chucking" class.

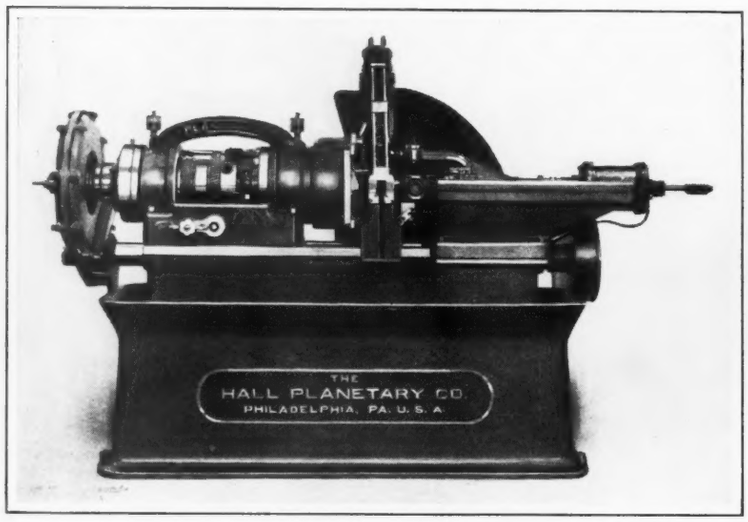


Fig. 1. Hall Planetary Machine with Automatic Magazine Feed

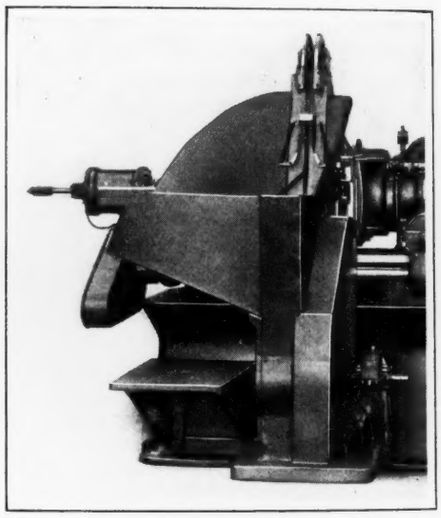


Fig. 2. The Self-contained Magazine Feed

The magazine feed is an individually motor-driven self-contained unit that is easily applied to the rear of any "Planetary" machine, as illustrated in Fig. 2. The parts to be machined are dumped into the magazine at the rear, where they are picked up by a conveyor chain that carries them to the top of a slide, always with the proper end foremost. From this point, the work pieces slide by gravity, as illustrated in Fig. 1, to the loading position, where each piece is picked up in sequence by the work-holding turret.

By thus removing the personal element in loading machines of this type, high production may be obtained, and one operator can tend to a large battery of machines. The turret machine to which this magazine is shown attached is of the same general type as that described in July, 1926, MACHINERY.

HUTHER BROS. SAW SHARPENER

A model No. 2 saw sharpener has recently been brought out by the Huther Bros. Saw Mfg. Co., Inc., Rochester, N. Y. While this grinder is designed primarily for sharpening fine- and coarse-pitch metal-cutting saws, it can also be used for sharpening any metal-cutting saw having a familiar type of teeth.

The machine is simple in operation and set-up, and the average operator can sharpen saws with unusual rapidity. It is especially desirable for the small saw user. The grinder is furnished with or without a motor drive, can be used for teeth spaced from 1/4 inch up, and may be employed with or without the index.

CHALLENGE BENCH AND FLOOR TYPE GRINDERS

Various types of bench and floor grinders built by the Challenge Machine Co., 5116 Springfield Ave., West Philadelphia, Pa., may be obtained with any of three styles of spindle bearings. Style A bearings are equipped with ball bearings which run in oil. Bearings of this style can be replaced with ease, as well as style B bearings, which are detachable and made of babbitt or bronze. Style B bearings have the Challenge cam set-collar, which prevents end play of the spindle, and are ring-oiled. Style C bearings are non-detachable babbitt bearings; they are also ring oiled and are provided with the cam set-collar.

Two methods of motor drive are obtainable for the different machines. In one drive, the grinding wheels are mounted direct on the motor shaft, as on the machine illustrated, and in the other drive, the wheel-spindle is driven by a belt from a motor contained in a box resting on the floor at the rear. Belt drives from countershafts can also be arranged for.

A foot-operated water attachment of the type shown provided for the left-hand wheel of the machine illustrated can be furnished. In order to deliver water to the wheel with this equipment, it is necessary to depress the foot-treadle, and when the treadle is released, the water recedes automatically from the wheel. With this arrangement, the wheel never stands in water.

The right-hand end of the machine illustrated is equipped with a disk wheel and a side-surface at-

Challenge Wet Tool and Disk Grinder

tachment, the table of which may be quickly adjusted to any angle between 45 degrees above and below the horizontal. A top-surface unit can also be furnished, in which case the work is passed over a slot in the table for the grinding operation. Another attachment consists of an under-surface unit which may be used for grinding either on the bottom or top sides of the wheel. Wheel guards arranged for connection to exhaust systems or other means of catching dust and grindings can be furnished. Various types of grinding wheel dressers are also manufactured by the same company.

GISHOLT TURRET LATHE

A 1L turret lathe intended for bar work up to 2 1/2 inches and chucking work up to 12 inches is being introduced to the trade by the Gisholt Machine Co., Madison, Wis. The new machine is a smaller turret lathe of the same general design as the 2L turret lathe described in September MACHINERY. It is driven through a single pulley running at 600 revolutions per minute, which affords a high initial speed from which twelve spindle speeds ranging from 20 to 486 revolutions per minute are derived through sliding gears and positive jaw clutches.

A motor of from 3 to 7 1/2 horsepower, running at 1200 revolutions per minute, is recommended. It may be mounted either on the headstock or on a special back plate, and connected by means of an Allis-Chalmers "Texrope," a belt, or a silent chain. A 12-inch three-jaw universal chuck is standard equipment for chucking work, but air or wrenchless chucks may also be supplied. The maximum swing is 17 inches over the ways and 14 inches over the side carriage, while the maximum distance from the face of the hexagon turret to the end of the spindle nose is 45 inches. The net weight of the machine, without tools, is about 4900 pounds.

The full-universal, full-swing, two-carriage principle employed on the larger Gisholt turret lathes has been used in this design also. A fixed center turret is standard equipment, and a cross-feeding turret is optional. Eight independent reversible feeds are incorporated in each apron. Another complete range of eight feeds is available through a lever at the headstock end of the machine. Longitudinal rapid traverses are provided for both carriages, and there is also a rapid traverse for the in and out movement of the square turret toolpost on the cross-slide. The feed-gears in the apron are speeded up for the rapid traverse.

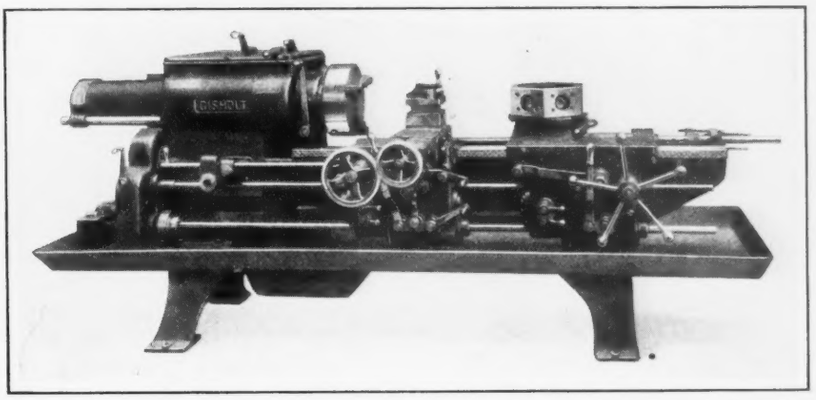
The ways of the bed are covered with hardened steel plates. Each movement of the rapid traverse lever, whether forward or backward, feeds a small amount of oil by pressure to the ways from a plunger in the apron. The feed train and traverse drive are lubricated with fresh oil from a Madison-Kipp automatic lubricator.

FOSDICK FRICTION TAPPER

A patented friction tapper has been brought out by the Fosdick Machine Tool Co., Cincinnati, Ohio, for application to the high-speed sensitive drilling machines manufactured by this concern. This tapping device is quickly attached to the lower end of the spindle sleeves. Through its use, holes can be tapped to the bottom without danger of tap breakage; consequently, the holes can be of various depths. The illustration shows the assembled mechanism at the left, with the disassembled parts at the right.

When driven by this mechanism, a tap responds instantly to whatever speed the machine is running at. The forward and reverse mechanism consists of two sets of sensitive, self-adjusting multiple friction disks which run in oil. Downward pressure on the feed-lever of the machine causes the tap to be driven forward, while upward pressure reverses the tap for backing it out of a hole.

An adjustable stop on the spindle sleeve permits accurate tapping to a predetermined depth, and automatic release of the tapping mechanism is obtained at the desired depth. Ball bearings are provided for all revolving parts. This tapper is made



Gisholt Turret Lathe Designed on the Two-carriage Principle

Fosdick Tapping Attachment and Disassembled Parts

in three sizes, the smallest size having a capacity for driving a 3/16-inch tap at 3000 revolutions per minute; the intermediate size, for driving a 5/16-inch tap at 1500 revolutions per minute; and the largest size, for driving a 1/2-inch tap at 500 revolutions per minute.

UNIVERSAL-MOTOR ELECTRIC DRILLS

Two portable electric drills equipped with universal motors for operating on either alternating or direct current have recently been placed on the market by the Standard Electrical Tool Co., 1938 W. Eighth St., Cincinnati, Ohio. The model shown in Fig. 1 is manufactured in 1/4- and 5/16-inch sizes, while that illustrated in Fig. 2 is made in 3/4-, 7/8-, and 1-inch sizes. Both models are of heavy-duty design. General Electric motors and S K F ball bearings are used.

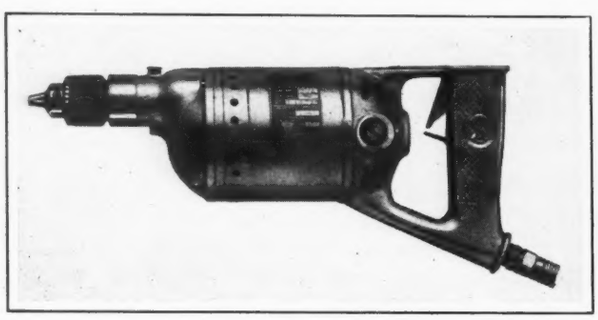


Fig. 1. Portable Electric Drill Made by the Standard Electrical Tool Co.

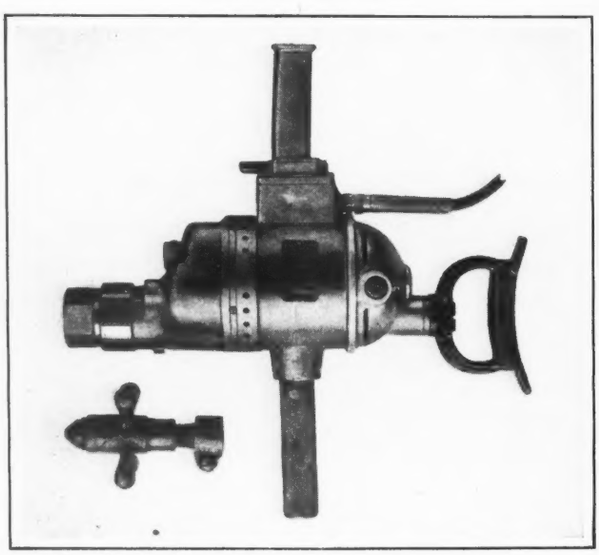
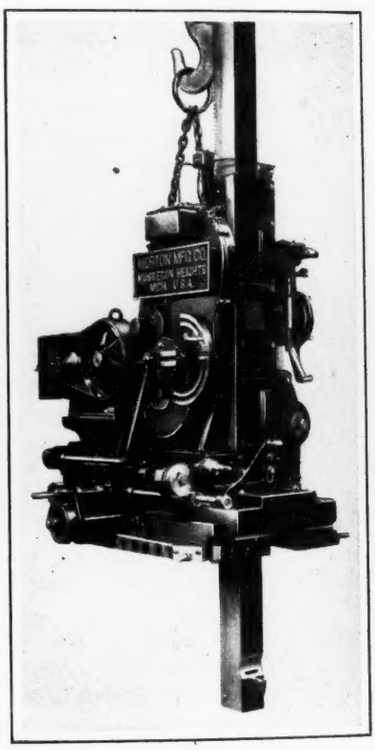


Fig. 2. Another Portable Electric Drill which Operates on Alternating or Direct Current

The motor housings are made entirely of aluminum to reduce the weight of the drills. The 1/4-inch drill weighs 7 3/4 pounds; the 5/16-inch drill, 8 1/2 pounds; the 3/4-inch drill, 23 pounds; the 7/8-inch drill, 24 pounds; and the 1-inch drill, 25 pounds. All capacities given refer to drilling in steel. A grip handle having a switch mounted therein is furnished on the drill shown in Fig. 1, while drills of the type illustrated in Fig. 2 have a spade handle and a feed-screw.

MORTON PORTABLE KEYWAY CUTTER

A portable keyway cutter having 72 inches of cutting stroke has been added to the line of equipment built by the Morton Mfg. Co., McKinney Ave. and Hoyt St., Muskegon Heights, Mich. This machine has a push-button control, a tappet disk for adjusting the stroke, and an automatic oiling system. The feed adjustment may be seen in the illustration, which shows the left-hand side of the machine.



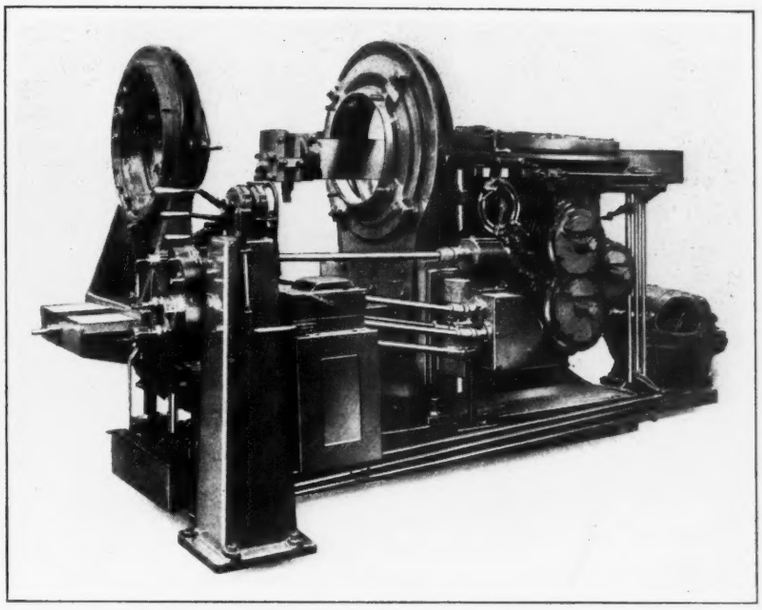
Morton Portable Keyway Cutter

This portable keyway cutter has an out and in feed of 8 inches. The smallest hole through which the ram will pass is 10 inches in diameter. Seven cutters from 2 1/2 to 4 inches wide, inclusive, varying by quarter inches, are furnished. This machine is of the draw-cut type, cutting on the upward stroke, and thus drawing the work against the base.

MORTON SPECIAL HEAVY-DUTY DRAW-CUT SHAPER

A special heavy-duty draw-cut shaper has been built by the Morton Mfg. Co., McKinney Ave. and Hoyt St., Muskegon Heights, Mich., for machining the pole pads on cast-steel motor magnet frames. The illustration shows the right-hand side of the machine, as well as the special pedestal with a push-button control and all levers for operating the machine. Special chucking equipment is provided for holding the motor magnet frames.

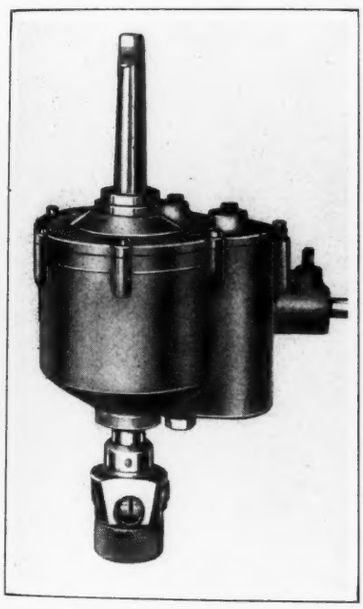
This machine has 60 inches of cutting stroke. Four vertical screws are used for raising and lowering the table. There are power horizontal and vertical feeds, and an automatic oiling system. The motor magnet frames are quickly placed in the special chucks and rotated by power feed in a few seconds time to the position required for finishing each of the pole pads.



Morton Draw-cut Shaper for Operations on Motor Magnet Frames

"ETTCO" HIGH-SPEED TAPPING ATTACHMENT

A No. 3 "Ettco" high-speed sensitive tapping attachment having a range of from 0 to 5/8 inch, has been added to the line manufactured by the Eastern Tube & Tool Co., 594 Johnson Ave., Brooklyn, N. Y. This attachment closely follows the construction of the Nos. 1 and 2 tapping attachments which were described in MACHINERY for June, 1922 and May, 1927, respectively, but the latest attachment (shown in the accompanying illustration) is larger and is equipped with enlarged leather-lined driving cones.



"Ettco" Tapping Attachment for Taps up to 5/8 Inch

A feature claimed for this attachment is that tap breakage from any cause is eliminated, the leather-lined cone clutch and cast-iron driving cone having a smoothness of action and a slipping point which prevents tap breakage. If a tap sticks or hits the bottom of a hole, the clutch slips, and if a tap sticks in backing out, the reverse cone slips.

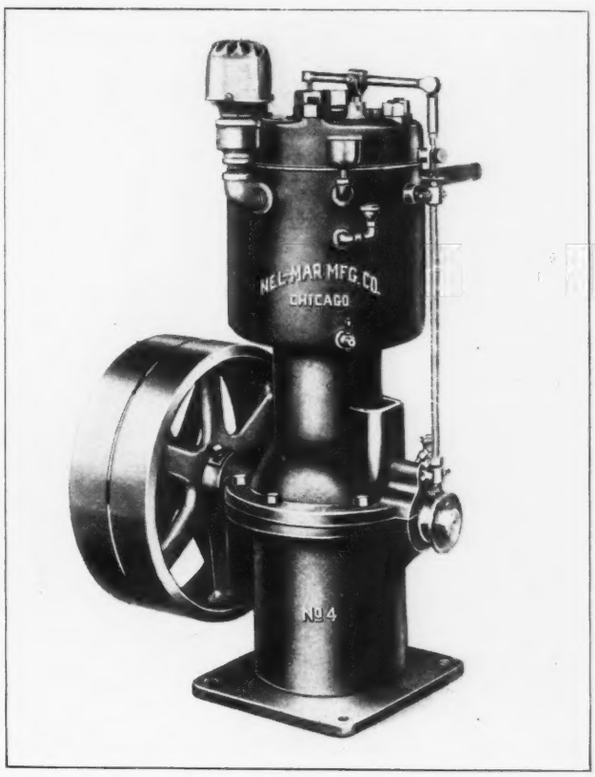
The reverse speed is twice as fast as the forward speed. By locking the threaded Morse shank in the attachment, left-hand threads can be produced as readily as right-hand threads. Material such as bakelite can be tapped successfully. An aluminum case and light alloy steel parts reduce the weight of the attachment. It can be applied to light drilling machines.

NEL-MAR AIR COMPRESSOR FOR SPRAYING OPERATIONS

An air compressor designed primarily for use in spraying lacquer, enamel, paint, celluloid, etc., has been developed by the Nel-Mar Mfg. Co., 946 W. Adams St., Chicago, Ill. This compressor is of the single-stage water-cooled type, using a rubber diaphragm to compress the air. The diaphragm is drawn down by the suction created by the piston on the down stroke and is forced up by a piston of special shape.

A particular feature of this compressor is the method of cooling the piston and diaphragm from the inside. Every time the piston goes down, it strikes the liquid in a chamber which causes the liquid to splash over the piston and the diaphragm. The liquid is kept cool by water circulating through jackets surrounding the chamber.

Oil never comes in contact with the air, and therefore the compressed air is free from oil and suitable for spraying purposes. A special air



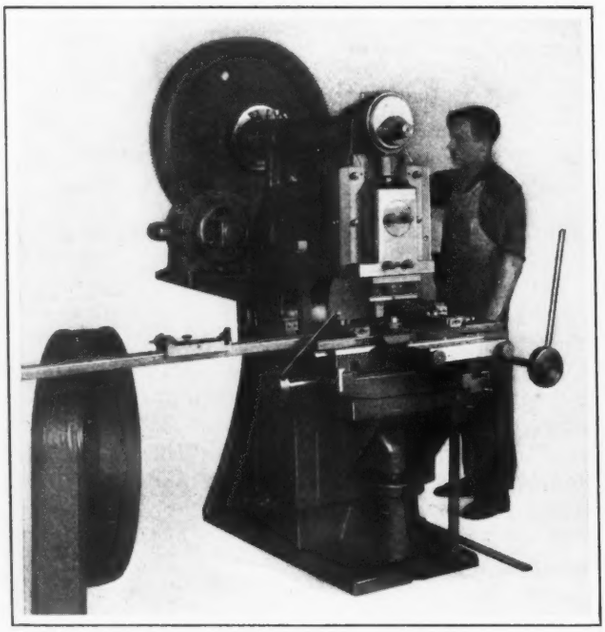
Nel-Mar Air Compressor Used in Spraying Paint, Lacquer, and Other Materials

cleaner at the intake removes all dirt and grit by centrifugal force before the air enters the compressor.

The capacity of the compressor shown is from 10 to 15 cubic feet of free air per minute, and the equipment produces a maximum pressure of 150 pounds per square inch. A one-horsepower motor is required for driving it. This compressor is built in both stationary and portable types.

"SEMCO" PUNCHING PRESS AND NIBBLING MACHINE

A No. 25 1/2-P punching press of an improved design, which delivers a pressure of 30 tons near the bottom of the stroke, has recently been developed by the Service Machine Co., 750-760 Broadway, Elizabeth, N. J. The pressure mentioned is approximately 50 per cent more than that of other machines previously built by the company. The gap or throat is 20 inches deep from the center of the slide, which permits piercing in the center of sheets 36 inches wide. At the same time the use of adjustable back gages is provided for. The slide has an improved up-and-down adjustment of 3 inches. A positive knockout is furnished in the slide for dies requiring it.



"Semco" Punching Press Arranged with a Table for Nibbling Operations

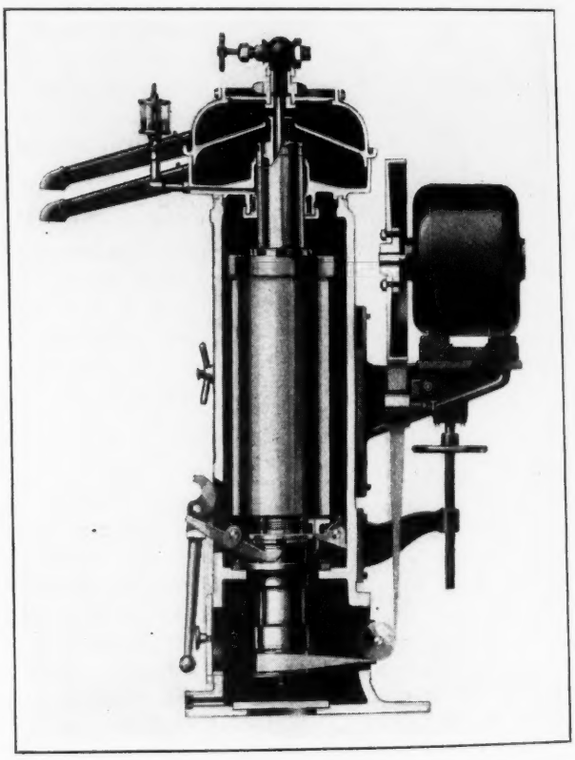
The top of the bed measures 16 by 24 inches, the bed comprising a separate knee casting which is adjustable in height to furnish a die space of from 6 to 14 inches. This bed adjustment permits setting deep drawing and forming dies and fixtures for lock seaming and curling operations on a large variety of work. The clutch is so designed that when set for regular work, a repeat stroke is impossible until the treadle has returned to the dead position and is again depressed.

The illustration shows this punching press arranged to function as a nibbling machine, being equipped with a universal nibbling table which can be conveniently removed when the press is wanted for other work. The attachment consists of three parts—a lower casting bolted to the press bed, a middle section which slides forward and backward, and a top table which has a lateral traverse. The slides are operated by means of rack-and-pinion mechanisms. Four-way adjustable gages and adjustable clamps provide for quickly and accurately setting both flat and contour work.

When, as frequently happens in the jobbing shop, a given size and shape of opening is to be pierced in a small run of work, the expense of making a regular die is prohibitive. With the nibbling machine, only a templet of the desired opening is required. This templet is clamped in the front extension of the table, the gages are quickly and accurately set, and the work can then be run through at a high rate of production.

CENTRIFUGAL SEPARATOR AND CLARIFIER

A "Positive" centrifugal separator and clarifier which may be applied in metal-working plants for cleaning lubricating and cutting oils or cutting compounds is being placed on the market by the Positive Machinery Division of the National Acme Co., Cleveland, Ohio. This constitutes two machines in one, since it can be quickly converted from a separator into a clarifier, when oils need clarification only, and vice versa. However, the machine also clarifies during the separating operation. It is intended for cleaning the oils or compounds after chips have been filtered or separated from them.

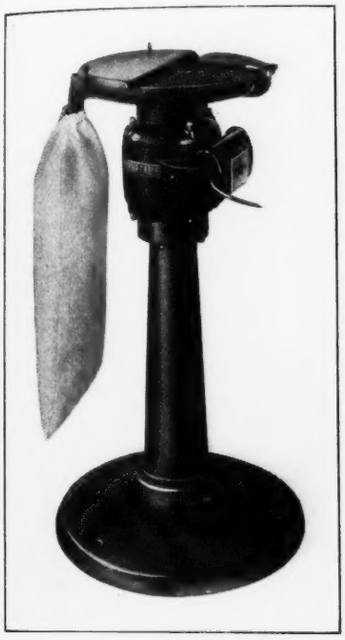


Centrifugal Separator and Clarifier Built by the National Acme Co.

The patented bowl construction enables the machine to give liquids an unusually long centrifugal travel and also furnishes large capacity for holding residue. The machine is of sturdy construction, the step bearing riding on two ball bearings, while the bowl cover is supported by an over-sized bronze bearing. The bowl, cylinder, and pulleys are statically and dynamically balanced.

SYRACUSE HORIZONTAL DISK GRINDER

Several improvements on the grinder described in November, 1926, MACHINERY, are embodied in a type D-3 horizontal disk grinder now being introduced to the trade by the Porter-Cable Machine Co., Syracuse, N. Y. For instance, the new machine is equipped with a bag into which approximately 90 per cent of the dust is carried. On previous types the dust was conveyed into the post of the machine and deposited on the floor at its base.



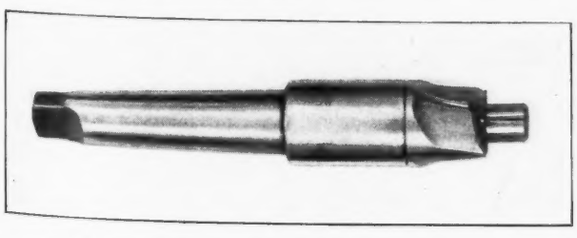
Syracuse Improved Disk Grinder

The base and pedestal are also of more rigid design than formerly and give a better balanced machine. The switch has been removed from the pedestal, and is now fastened to a special casting bolted to the motor legs. In this location, the switch is far more convenient for the operator and eliminates all wires on the outside of the machine, with the exception of the cord which connects the machine to the power line.

The solid iron disk is carefully balanced after machining, and is supported by an over-size thrust bearing built into the motor. The latter is of ball-bearing construction. The disk is 15 inches in diameter and is 39 inches above the floor. The motor is of 1 2 horsepower capacity and runs at 1725 revolutions per minute, giving a surface speed up to 6500 feet per minute. The net weight of the equipment is approximately 180 pounds.

SCULLY-JONES COUNTERBORE AND SPOT-FACER

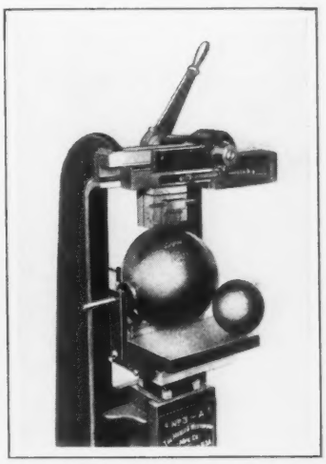
A counterbore and spot-facing tool of the construction illustrated represents the latest addition to the line of "Wear-Ever" tools manufactured by Scully-Jones & Co., 1901 S. Rockwell St., Chicago, Ill. This tool embodies the "driving by the square" and "centering by the shank" principles of other products made by the company. Simplicity of design and operation, as well as strength and rigidity, are features of the tool.



Scully-Jones Counterbore and Spot-facing Tool

INTERESTING USE OF A MARKING MACHINE

A machine applicable for marking bowling balls of different sizes with a trade name and a serial number has recently been brought out by the Noble & Westbrook Mfg. Co., Hartford, Conn. The marking is done by means of a special die and an automatic numbering head, arranged as illustrated.



Marking Bowling Balls

The table or holding fixture is provided with a roller-bearing slide and two adjustable stops which allow for placing the ball centrally under the numbering head. Pressure is then applied through a foot-treadle. The mark is made by pulling the handle to rotate the ball on the fixture, both the name and the serial number being marked in one operation. The numbering head automatically advances one figure with each depression of the handle.

* * *

THE BRITISH METAL-WORKING INDUSTRIES

From MACHINERY's Special Correspondent

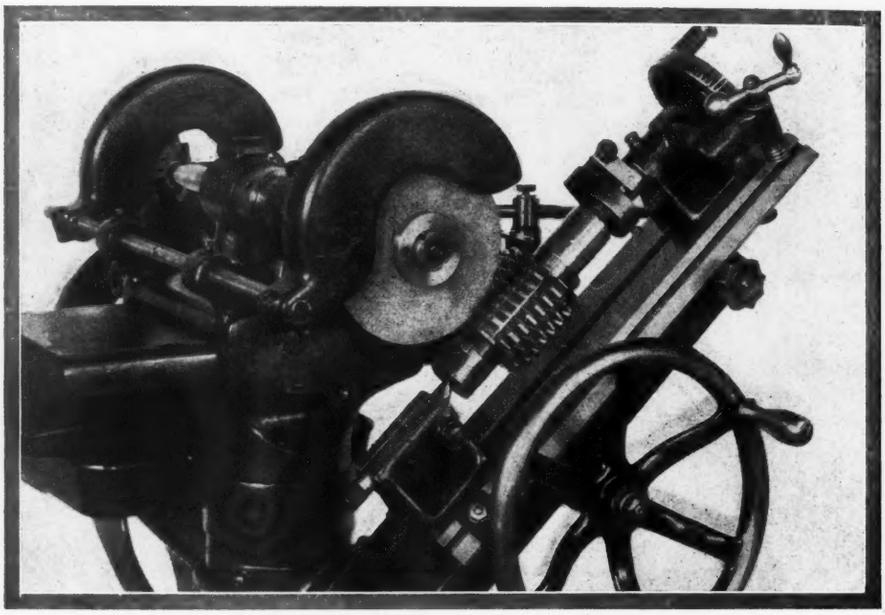
London, December 15, 1927

Apart from slight setbacks in one or two directions, notably in the automobile industries, the satisfactory conditions referred to last month are well maintained in the British metal-working industries. As an index of current trade conditions, the interest evinced by manufacturers in the British Industries Fair, to be held in London and Birmingham from February 20 to March 2, may be cited. Up to the present time, application has been made for 400,000 square feet of exhibition space.

On the whole, machine tool makers are well employed, and the complaint of a scarcity of inquiries and still fewer orders is heard less often. Manufacturers of special machinery for automobile and railway shops are particularly busy. There is no doubt that the value of single-purpose machines is becoming more and more appreciated, and many firms are probably only delaying the placing of orders until such time as trade prospects over a considerable period ahead are brighter. Single-purpose and standard high-production milling, drilling, and grinding machines are perhaps the best selling lines at present.

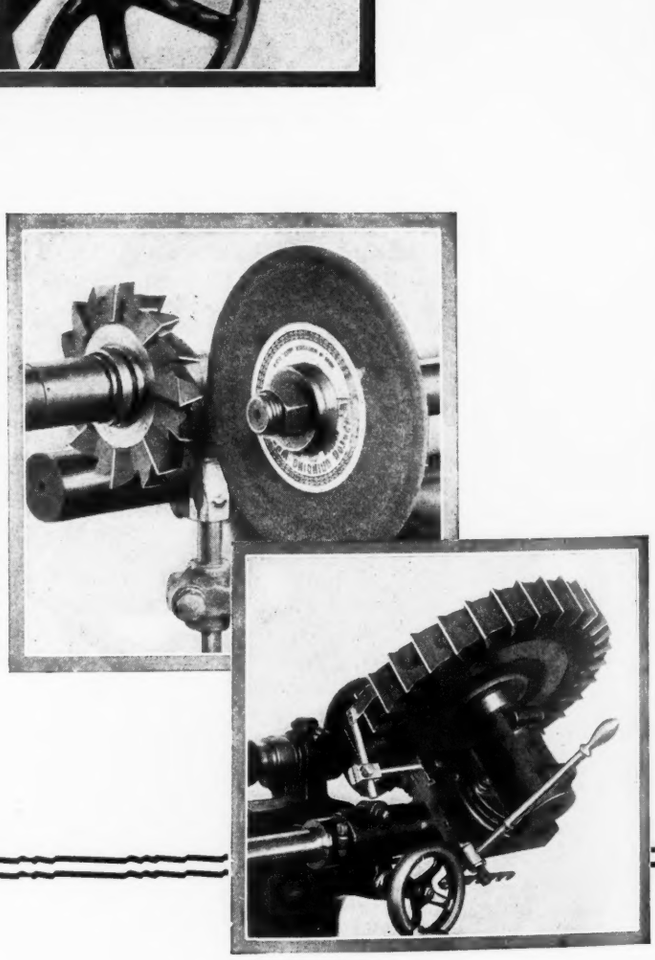
The slight depression noted in the automobile industries during recent weeks can probably be attributed to the anticipation of the new British Ford cars. Buyers have been chary in placing orders until they knew what the Ford factories had to offer, and manufacturers have been in the position of not knowing what new competition they were to be called upon to meet. Now that the new car has been on exhibition and the prices have been announced, a return to more settled conditions may be expected.

Don't let dull cutters "eat up" your pr

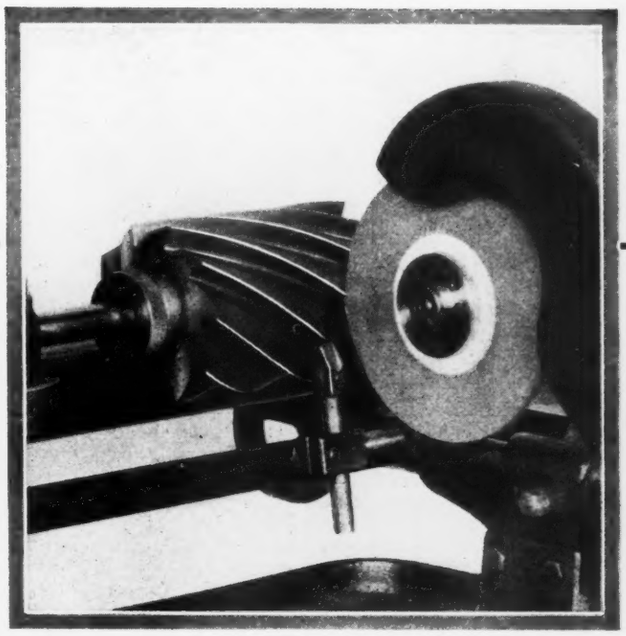


Straight gashed hobs and formed cutters may be sharpened accurately, on either the Nos. 2 or 3 machines with the use of the Formed Cutter Grinding Attachment. In the view above, the attachment is set up on a No. 3 machine.

Two typical jobs on the No. 2 machine—right, sharpening the face of the teeth of a Staggered Tooth Side Milling Cutter, and below, sharpening the sides of the teeth of an Inserted Tooth Side Milling Cutter. The adaptability of this machine is, practically, limited only by the ingenuity of the user.



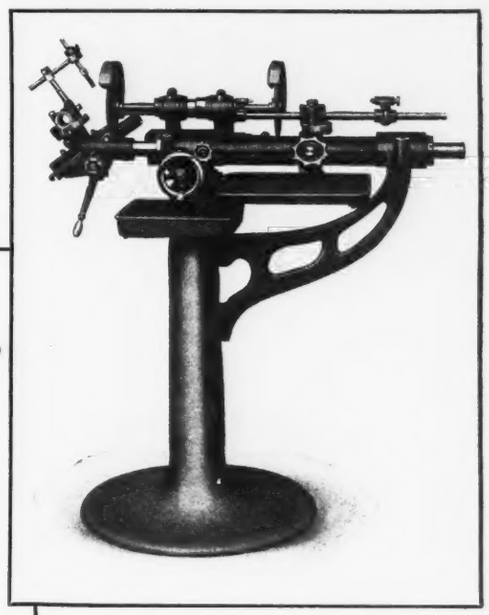
ou profits

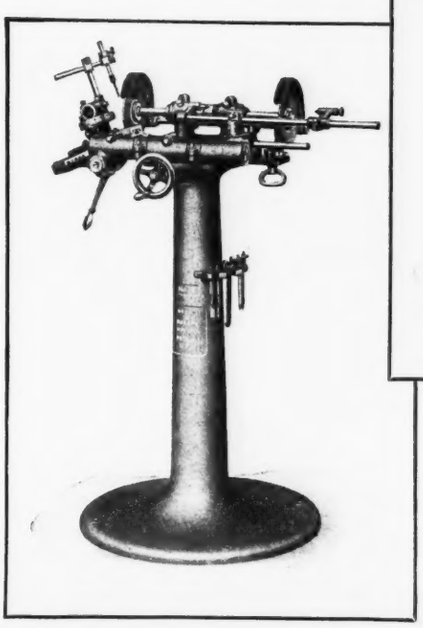


A DULL cutter is sure to slow up your work, increase your costs and "eat up" profits. The obvious remedy is to sharpen it, at the first sign of dullness.

You can renew the profit assuring "cutability" of all types of cutters and reamers quickly and accurately with Brown & Sharpe Grinding equipment. The No. 2 Cutter Grinding and the No. 3 Universal Cutter and Reamer Grinding Machines are accurate, sturdily built, and easily set up and operated.

Let our representative go over your requirements with you with a view of recommending the right size and number of machines for your plant. The No. 138 General Catalog lists both of these machines. Keep a copy on hand for reference.





BROWN & SHARPE
CUTTER and TOOL
GRINDING
MACHINES

No. 13
Universal and Tool

Nos. 2 and 3
Cutter and Tool

Nos. 0 and 1
Tool

BROWN & SHARPE

BROWN & SHARPE MFG. CO. PROVIDENCE, R. I., U. S. A.

TRADE NOTES

PARKER-KALON CORPORATION, manufacturer of screws, nails, and other products, has moved its factory and offices from 352 W. 13th St., to 200 Varick St., New York City.

SCOVILLES MACHINE SHOP, Ashtabula, Ohio, has just completed a new building at 317 Main St., Ashtabula, having about 8000 square feet of floor space. The shop is engaged in contract machine work and the building of special machinery, as well as motor repair work.

AMERICAN GEAR MANUFACTURERS' ASSOCIATION announces that the secretary's office has been moved to 3608 Euclid Ave., Cleveland, Ohio. It has also been announced by the association that its twelfth annual meeting will be held in Rochester, N. Y., some time during the month of April, 1928.

ROLLWAY BEARING CO., INC., Syracuse, N. Y., manufacturer of roller bearings, has opened a sales office at 614 Empire Bldg., Pittsburg, Pa. Samuel Farrell, who has been affiliated with the company for a number of years, with headquarters at Youngstown, Ohio, will be in charge of the new office.

ZIV STEEL & WIRE CO., 2945 W. Harrison St., Chicago, Ill., announces a change in officers as follows: President, G. F. Ziv; chairman of board, A. Ziv; vice-president, N. J. Hyslip; secretary, M. Foley; and treasurer, H. E. Ziv. A. F. Brunck has been appointed general sales manager, with headquarters in Chicago.

SCULLY-JONES & CO., manufacturers of the "Wear-Ever" line of production tools, formerly located at 13th and Robey Sts., Chicago, Ill., have moved into their new plant at 1901 S. Rockwell St., Chicago, where they will have increased manufacturing facilities and will be in a position to give immediate service to small tool users.

CHICAGO MACHINERY & STEEL CO., 263 N. California Ave., Chicago, Ill., has been formed by William P. Devery to engage in the buying and selling of new and used machine tools, structural equipment, electric hoists, traveling cranes, forging equipment, hydraulic equipment, high-speed and cold-rolled steel and small tools and supplies.

GIBSON & HALPERN, machinery sales engineers, have moved to larger quarters at 63 Wall St., New York City. In addition to the domestic trade throughout the New York district, this firm is actively engaged in building up business for American factories in export fields. D. J. Gibson formerly had charge of the export business of the Worthington Pump & Machinery Corporation, and B. M. Halpern acted as his assistant.

GILBY WIRE CO., for the last five years located at 123 Jackson St., Newark, N. J., has moved into its new plant on Riverside Ave., Newark. The new plant consists of three modern factory buildings, of brick and steel construction and of the all-daylight type. The new plant will have practically twice the floor space available in the old quarters, and the buildings are so laid out that there is ample room for additions required.

WILMARTH & MORMAN CO., Grand Rapids, Mich., announces that its sales and executive offices have been moved to Big Rapids, Mich., in view of the recent consolidation of the company with the Machinery Co. of America. All mail should now be addressed to the Wilmarth & Morman Division, Machinery Co. of America, Big Rapids, Mich. The Wilmarth & Morman factory has been moved to the Covel Branch at Benton Harbor, Mich.

NORTON CO., Worcester, Mass., has purchased the entire capital stock of Bethel-Player & Co., Inc., of Westboro, Mass., manufacturer of lapping machinery, including crankshaft lapping machines, cylindrical and flat lapping machines, hole and cylinder lapping machines, and tool-room bench laps. Sydney Player and Joseph N. Bethel, general manager and foreign sales representative, respectively, of Bethel-Player & Co., will be associated with the Norton organization.

HIGLEY MACHINE CO., South Norwalk, Conn., has recently closed a contract, under the terms of which the Black Rock Mfg. Co., of Bridgeport, Conn., will manufacture the Higley line of cold sawing equipment. The Higley Machine Co. will continue to maintain its own offices, engineering and sales department, under the management of L. M. Waite, who for the last two years, in connection with C. B. Foster, chief engineer, has been actively engaged in the development of Higley cold sawing equipment.

BRIDGEPORT BRASS CO., Bridgeport, Conn., announces that a district office has been opened in the Park Square Bldg., Boston, Mass. This building is located in the Back Bay district, a short distance from the Copley Plaza Hotel and the Back Bay station. All the representatives of the Bridgeport Brass Co. that make Boston their headquarters will work from this office. William J. Hawkins is in charge of the newly created office. Mr. Hawkins has been associated with the company for over twenty years.

SIMONDS SAW & STEEL CO., Fitchburg, Mass., announces that William B. Turner, Twin Falls, Idaho, is the winner of the principal prize of $1000 in the fifth annual economic essay contest conducted by Alvan T. Simonds, president of the company. Mr. Turner was formerly superintendent of the Spokane, Wash., schools, and later the head of the Spokane County Schools, as well as principal of the Washington State Normal School at Cheney, Wash. The annual prizes offered by Mr. Simonds are intended to advance the study of economics in the schools throughout the country.

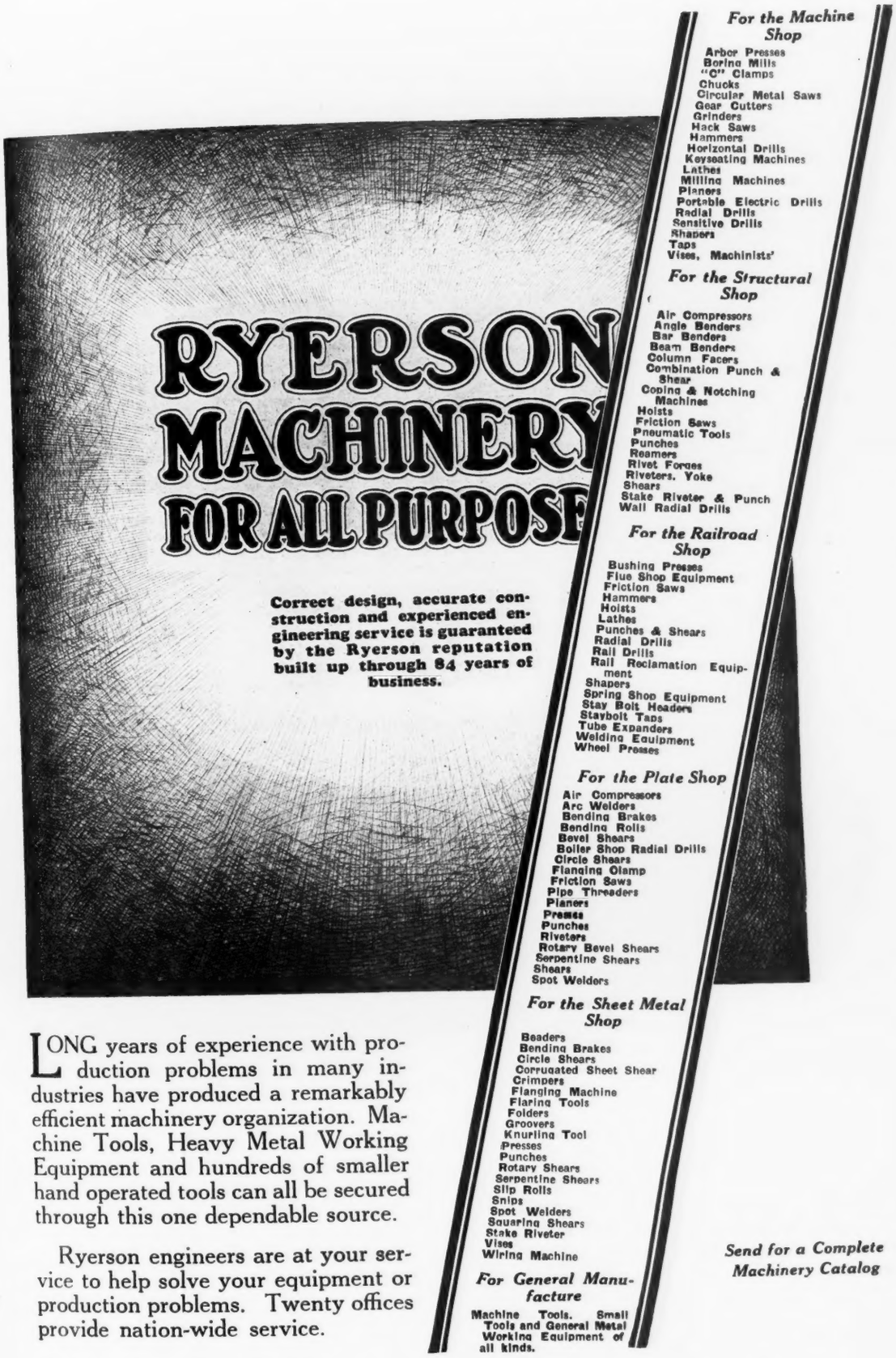
AMERICAN BLOWER CO., Detroit, Mich., and the AMERICAN RADIATOR CO., New York City, announce a merger of the two companies. Each company will operate in the future much the same as in the past, there being no change in the personnel, business methods, and management, the merger merely making possible important economies in buying, marketing, and manufacturing in the heating, ventilating, air conditioning, and mechanical draft apparatus field. The companies have manufacturing plants in many cities throughout the country, and sales offices in all the principal cities.

PRATT & WHITNEY CO., Hartford, Conn., has just shipped twelve carloads of machine tools and auxiliary equipment—one of the largest foreign shipments made in recent years by an American machine tool manufacturer on a single contract—to the Japanese Government, the order consisting of standard machine tools, jigs, fixtures, gages, and general tooling equipment requiring a great amount of engineering and designing. Full details of the requirements were not available until last July, but the contract was completed in November, over one month ahead of the time specified.

An organization under the title of ENGINEERING ASSOCIATES, INC., with headquarters at 11 Beacon St., Boston, Mass., has been formed by James C. Boyd, Henry R. Kent, Harry M. Haven, Lester W. Tucker, Arthur T. Hopkins, E. L. C. Clark and Lewis R. Smith, for the purpose of providing in one group the engineering, construction, and financial experience of established organizations, and to make available complete service in all branches of engineering and kindred work. All these gentlemen are widely and favorably known in their professions, and their combined facilities should be of unusual value to those desiring services of that character.

JOSEPH T. RYERSON & SON, INC., 16th and Rockwell Sts., Chicago, Ill., has taken over the exclusive sales of Glasgow iron to the railroads of the country. Glasgow iron is a pure puddled, doubly refined, rolled wrought iron formerly made by the Glasgow Iron Co. of Pottstown, Pa. The billets are furnished in sizes of from 2½ to 8 inches thick and from 6 to 18 inches wide, and in 6- to 10-inch squares in the usual lengths. The specifications are as follows: Tensile strength, about 45,000 to 46,000 pounds per square inch; yield point, 50 per cent tensile strength minimum; reduction of area, 32 to 37 per cent, depending on size; and elongation in 8 inches, 22 to 25 per cent.

NILES-BEMENT-POND CO., 111 Broadway, New York City, at a recent meeting of the board of directors increased the number of directors to fifteen. The following additions to the board were made: Charles K. Seymour, vice-president-secretary-treasurer, was elected a director and a member of the executive committee; Clayton R. Burt, vice-president and general manager of the Pratt & Whitney Division, Frederick B. Rentschler, president of the Pratt & Whitney Aircraft Co., Sydney Buckley, vice-president of the Niles Crane Division and Edwin H. Peirce, vice-president and general manager of the Niles Tool Works Division, were elected directors. The company also announces the following changes in its sales organization: W. P. Kirk, previously sales manager of the Pratt & Whitney Co., has been made general sales manager of the Niles-Bement-Pond Co. and all its domestic divisions. Harold F. Welch, who has been sales manager of the Niles Tool Works Division, has been made sales manager of the New York territory of the Niles-Bement-Pond Co., and will also act as adviser to the president on sales matters. William Hunter, who has for a number of years been connected with the Philadelphia office, has been appointed acting manager of that territory.



LONG years of experience with production problems in many industries have produced a remarkably efficient machinery organization. Machine Tools, Heavy Metal Working Equipment and hundreds of smaller hand operated tools can all be secured through this one dependable source.

Ryerson engineers are at your service to help solve your equipment or production problems. Twenty offices provide nation-wide service.

Send for a Complete Machinery Catalog

JOSEPH T. RYERSON & SON INC.
ESTABLISHED 1842

Chicago, Milwaukee, Duluth, Minneapolis, Denver, San Francisco, Los Angeles, Houston, Tulsa, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Pittsburgh, Richmond, Philadelphia, Boston, Jersey City, New York

PERSONALS

E. F. HOFF has been transferred from the Welder Division of the Lincoln Electric Co. at Cleveland, Ohio, to the Welder Division at New York City, where he will be in charge of welder service under the direction of G. N. Bull, district manager.

J. I. BURGESS, formerly with the National Acme Co. of Cleveland, Ohio, and more recently sales manager of the National Pipe Products Corporation, Rochester, Pa., has been elected president of the Ambridge Tool & Die Mfg. Co., 1616 Merchant St., Ambridge, Pa.

VAN CORTRIGHT MEKEEL, formerly connected with the Taylor-Wharton Iron & Steel Co. of High Bridge, N. J., in the capacity of special research investigator, mechanical engineer, and sales engineer, has become special representative of the Nugent Steel Castings Co., Chicago, Ill.

I. F. BAKER has been promoted to the position of manager of the Far Eastern Department of the Westinghouse International Co. He comes to his new position from Japan, where he was managing director of the Westinghouse Electric Co. of Japan. His new offices will be in New York.

R. M. PLYMPTON has been appointed salesman of the Lincoln Electric Co., Cleveland, Ohio, in charge of consumer motor business in Chicago. Mr. Plympton will work under the direction of R. D. Malm, Chicago district manager. He was formerly assistant sales manager for the Babson Statistical Association, Wellesley Hills, Mass.

J. W. WHITE was elected a director and managing director of the Westinghouse Electric Co. of Japan, at a recent meeting of the board of directors. Mr. White has had a wide experience with the Westinghouse company, both in the United States and abroad, having been general manager of the Japan company, manager of the power section of the Detroit office, and manager of the Westinghouse International Co. of Cuba.

W. A. KNERR, formerly purchasing agent of the Diamond State Fibre Co., Bridgeport, Pa., and the Celoron Co. (a division of the former company), is now secretary of the Norristown branch of the Pennsylvania Manufacturers' Association. LAWRENCE T. KRATZ has become buyer, in place of Mr. Knerr, for the Celoron Co. and WALLACE MCCARTER, buyer for the Diamond State Fibre Co. Both Mr. Kratz and Mr. McCarter have been connected with the purchasing department for several years.

L. P. ALFORD, editor of *Manufacturing Industries*, New York City, was awarded, by the American Society of Mechanical Engineers at its annual meeting, the Rear-Admiral George W. Melville Medal for the principal professional paper presented to the society during the past year. Mr. Alford was the first engineer to receive the medal, the award being made for his paper "Laws of Manufacturing Management," which has been referred to as the first comprehensive statement of the fundamentals of industrial management.

GALEN SNOW, for the last five years advertising and sales promotion manager of the Greenfield Tap & Die Corporation, Greenfield, Mass., has resigned to become treasurer of W. B. Remington, Inc., Springfield, Mass., a national advertising agency. Mr. Snow has been active for some time in advertising and marketing work. He has been a member of the Association of National Advertisers and of the National Industrial Advertisers' Association. Last spring he received one of the A. W. Shaw awards for his analysis of the industrial markets of the United States.

HAROLD A. THOMAS, professor of hydraulics in the department of civil engineering at the Carnegie Institute of Technology, has been appointed hydraulic engineer for the city of Pittsburg to make a study of flood heights as affected by various proposed changes in the water fronts. Professor Thomas has been a member of the faculty at the Carnegie Institute for four years. He went there from the Rose Polytechnic Institute after thirteen years of service. He has also served as consulting engineer for the Pennsylvania Railroad in connection with numerous cases of damage by floods.

R. M. WELCH has joined the staff of G. W. Brogan, Inc., Towson, Md., advertising counsel. Mr. Welch will be engaged in the automotive service and tool field in which he has had considerable experience, having been engaged as salesman for the Carey Machinery Co., mill supply jobbers of Baltimore, Md., as service manager with the Lambert Automobile Co., Hudson dealers in Baltimore; and for the last fourteen years in charge of the company garage of the Consolidated Gas, Electric Light and Power Co. of Baltimore, where he had under his direction the maintenance of over 500 company cars.

BRENT A. TOZZER, New York sales manager of the Niles Tool Works Co. and the Pratt & Whitney Co., 111 Broadway, New York City, has resigned. Mr. Tozzer became connected with the machine tool industry in 1901, when he entered the employ of the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, serving as salesman, advertising writer, and European representative until 1908. In that year he became associated with the Niles-Bement-Pond Co. and the Pratt & Whitney Co., going to Cleveland, Ohio, where he organized a branch office and continued to manage it until 1925, when he was transferred to New York as the manager of the New York sales office. In 1920-1921 he made a trip for the Niles Co. to the Far East to investigate the machine tool markets in China, India, the Dutch East Indies, Siam, Indo-China, and the Malay Peninsula.

COMING EVENTS

JANUARY 24-27—Annual meeting of the Society of Automotive Engineers in Detroit, Mich. Coker F. Clarkson, secretary, 29 W. 39th St., New York City.

FEBRUARY 14-17—Third Mid-west power conference to be held in Chicago, Ill., under the auspices of nine national and local engineering societies, including the Chicago Section of the American Society of Mechanical Engineers. Fred B. Orr, secretary-treasurer, Room 1136, 72 W. Adams St., Chicago, Ill.

APRIL 3-5—Fifth annual convention of the American Oil Burner Association at the Hotel Stevens, Chicago, Ill. An exposition of oil burners will be held in connection with the convention. For further information, address the secretary of the association, 350 Madison Ave., New York City.

MAY 14-17—Spring meeting of the American Society of Mechanical Engineers in Pittsburg, Pa. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

MAY 14-18—Twenty-first annual exhibit of machines, equipment, materials and supplies for foundries and the allied industries in the Commercial Museum, Philadelphia, Pa. In conjunction with the exhibit, the thirty-second annual convention of the American Foundrymen's Association will be held. C. E. Hoyt, manager of exhibits, 140 S. Dearborn St., Chicago, Ill.

JUNE 13-20—Annual meeting of the Mechanical Division V of the American Railway Association in Atlantic City, N. J.

JUNE 13-20—Annual convention and exhibition of the Railway Supply Manufacturers' Association in Atlantic City, N. J. Secretary-treasurer, J. D. Conway, 1841 Oliver Bldg., Pittsburgh, Pa.

JUNE 25-29—Annual meeting of the Society for the Promotion of Engineering Education at the University of North Carolina, Chapel Hill, N. C. For further information, address Dean Braune, University of North Carolina.

JUNE 26-29—Semi-annual meeting of the Society of Automotive Engineers at the Chateau Frontenac, Quebec, Canada. Coker F. Clarkson, secretary, 29 W. 39th St., New York City.

OCTOBER 8-12—Annual convention of the American Society for Steel Treating, to be held in conjunction with the tenth National Metal Exposition at Philadelphia, Pa. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland.

CALENDARS RECEIVED

UNION SWITCH & SIGNAL CO., Swissvale, Pa., manufacturer of drop-forgings. Calendar for 1928, showing three months on each sheet.

WHITMAN BARNES-DETROIT CORPORATION, Detroit, Mich., manufacturer of twist drills, reamers, cutters, etc., is distributing a calendar for 1928, each sheet of which shows three months.

NEW BOOKS AND PAMPHLETS

THE LIMITS OF ACCURACY OF MACHINE TOOLS (Die Arbeitsgenauigkeit der Werkzeugmaschinen). By G. Schlesinger, Professor at the Technical Institute of Berlin. 40 pages, 8½ by 11½ inches; numerous illustrations. Published by Julius Springer, Berlin, Germany. Price, 6 Marks.

This book contains an original and painstaking study of the limits of accuracy of different types of machine tools, covering all the important dimensions that determine the accuracy of the machine and that have to be tested in order to thoroughly inspect its working precision. Illustrations are provided in each instance showing definitely how the inspection test is applied to the machine, and the limits of accuracy required are tabulated beneath the illustrations. The book is printed in German.

A. S. T. M. STANDARDS. Part I (Metals) 871 pages, 6 by 9 inches. Part II (Nonmetallic materials), 1000 pages, 6 by 9 inches. Published by the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa. Price, Parts I and II, cloth, $7.50 each; half-leather, $9 each. Both parts, cloth, $14; half-leather, $17.

These two volumes cover standards adopted by the society, Part I relating to standards for metals, including steel, wrought iron, pig and cast iron, ferro-alloys, non-ferrous metals, and miscellaneous subjects. Part II, dealing with non-metals, gives standards relating to cement,

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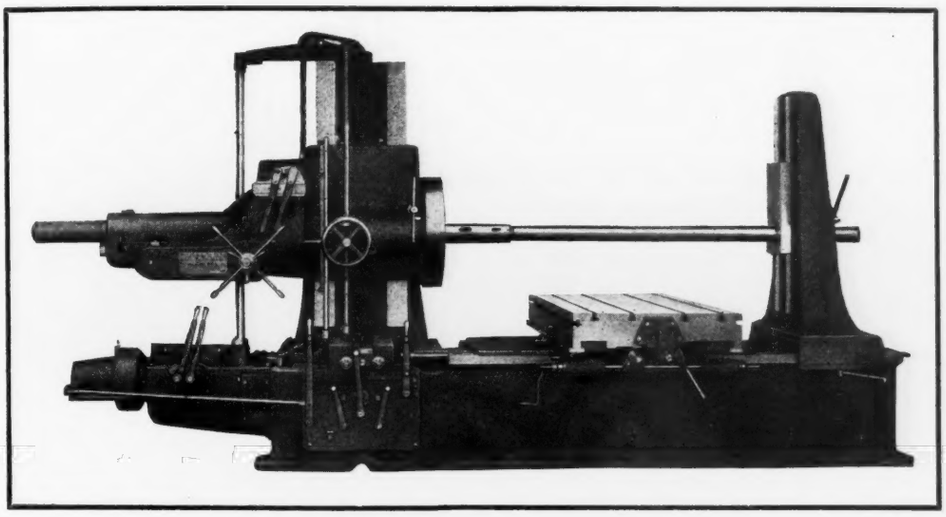

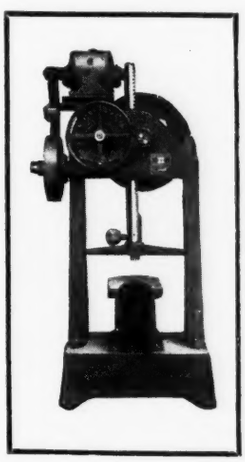

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AUDITING THEORY AND PRACTICE. By Robert H. Montgomery. 859 pages, 6 by 8½ inches. Published by the Ronald Press Co., 15 E. 26th St., New York City. Price, $6.

This is the fourth edition of a well-known book on auditing, the purpose of which is to set forth the principles underlying the practice of auditing and to outline the work that must be done in any audit. The present edition has been completely revised to include the sweeping changes that have been made in the last half dozen years, not only in accounting but also in banking, finance, credit, and related fields. The author covers the subject thoroughly, including balance sheet auditing, inventories, income accounts, auditors' reports, investigations, detailed auditing, etc. Particular attention is given to depreciation principles and rates, especially as affected by income tax legislature. Examples of approved balance sheets and approved methods for statements are included in the appendix.

THE BROWN & SHARPE HANDBOOK. 294 pages, 4 3/4 by 6 3/4 inches. Issued by the Brown & Sharpe Mfg. Co., Providence, R. I. Price, 75 cents.

This is a new and improved edition of a little handbook previously known as "A Handbook for Apprentice Machinists." The scope of the book has been broadened considerably. It contains a great deal of useful information and suggestions for young machinists and apprentices. The numerous illustrations make it an easy matter to follow the text. Many useful tables are also included. The text is divided into fifteen sections dealing with the following subjects: Drawings; The Use of Lay-out and Inspection Tools; Chipping, Filing, and Bench Work; Lathe Work; Drills, Drilling, and Drilling Machines; Planing; Milling and Milling Cutters; Grinding; Gears and Gear Cutting; Screw Machine Work; Miscellaneous Tools and Methods; Toolmaking; Materials of Construction; Heat-treatment; Shafting, Pulleys, and Belts; Square and Square Root—Cube and Cube Root.

MODERN AIRCRAFT. By Victor W. Page. 855 pages, 6 by 9 inches. Published by the Norman W. Henley Publishing Co., 2 W. 45th St., New York City. Price, $5.

This is a complete treatise outlining the elements of aeronautical engineering, prepared with special reference to the requirements of those wishing to become familiar with aviation in all its branches. It covers basic principles, operation, application, construction, repair, and maintenance. Simplified explanations are given of the theory of flight, aerodynamics, and principles underlying the action of dirigibles and airplanes of all kinds. The book gives instructions for lining up and inspecting typical airplanes before flight, and also gives easily understood rules for flying and aircraft power plant design, installation, and care. The author, Major Page of the U. S. Army Air Corps Reserves, was chief engineering officer at the Hazelhurst Field, Mineola, Long Island, in 1917, and chief aeronautical engineer at the largest aviation school operated by the A. E. F. in France during the War, having several thousand engines and hundreds of airplanes under his supervision. It will therefore be apparent that the information given should embrace much of practical value to all interested in aviation.

NEW CATALOGUES AND CIRCULARS

TEST INDICATORS. **H. A. Lowe, 1874 E.** 66th St., Cleveland, Ohio. Circular illustrating and containing list prices of the "Last Word" line of test indicators.

GEARS. General Electric Co., Schenectady, N. Y. Circular GEA-853, illustrating and describing solid versus split gears for railway and industrial haulage motors.

GRINDING WHEEL CHUCKS. Norton Co., Worcester, Mass. Pamphlet describing in detail the Norton chuck for segmental wheels on Blanchard grinding machines.

WOODWORKING MACHINERY. Oliver Machinery Co., Grand Rapids, Mich. Catalogue 24, illustrating and describing the Oliver Junior line of portable woodworking machinery.

GRINDERS. Challenge Machine Co., Philadelphia, Pa. Catalogue covering the line of Challenge emery grinders, giving complete specifications of the various styles, including prices.

LIGHTING EQUIPMENT. Crouse-Hinds Co., Syracuse, N. Y. Folder 46, illustrating floodlight projectors for industrial, shipping, railroad, construction, and advertising illumination, etc.

FRICTION CLUTCHES. A Plamondon Division, Foote Bros. Gear & Machine Co., 232-242 N. Curtis St., Chicago, Ill. Leaflet outlining the important features of construction of the A. Plamondon disk-type friction clutch.

ELECTRIC FITTINGS. Crouse-Hinds Co., Syracuse, N. Y. Folder 53, entitled "Taping and Splicing is Easy with the New Obround Condulet." Bulletin 2104, illustrating and giving the list prices of "Wedgetite" pipe hangers.

HEAT-TREATING EQUIPMENT. Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. Circular No. 6 of a heat-treating series, dealing with the subject of hardening equipment, with particular reference to the "Hump" method.

MAGNETIC BRAKES. Cutler-Hammer Mfg. Co., 166 Twelfth St., Milwaukee, Wis. Booklet entitled "When Industry Says Stop," explaining in detail the construction and operation of all types of magnetic brakes both for alternating and direct current.

BALL AND ROLLER BEARINGS. RBF Ball Bearing Co., 33 W. 60th St., New York City. General catalogue No. 9 of RBF ball and roller bearings, containing complete data, including dimension, radial load ratings, and weights of these bearings.

ROLLER BEARINGS. Hyatt Roller Bearing Co., Harrison, N. J. Publication entitled "Hyatt Equipped Railroad Journal Boxes," discussing the application of roller bearings to railroad journal boxes, and the savings that are effected in this class of service.

SMALL TOOLS. Scully-Jones & Co., Tool Division, 1901-12 S. Rockwell St., Chicago, Ill. Supplement to small tool catalogue 35, listing and describing the latest addition to the line of "Wear-Ever" production tools, namely, the Scully-Jones counterbore and spot-facing tool.

OXY-ACETYLENE WELDING AND CUTTING APPARATUS. Alexander Milburn Co., 1416 W. Baltimore St., Baltimore, Md. Bulletins B-200C and B-200D illustrating and describing, respectively, Milburn acetylene generators and Milburn oil burners and preheaters.

POWER SCRAPING TOOLS. Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill. Catalogue describing the distinctive features of the Anderson power scraper, with natural hand control. The illustrations show the application of this tool on various classes of work.

PRESSES. Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J. Circular containing a treatise on the hot-pressing of brass parts, dealing with the advantages of hot-pressed brass parts, methods employed, composition of metal, construction of dies, and selection of a suitable type of press.

HOISTS AND CHAIN BLOCKS. Reading Chain & Block Corporation, Reading, Pa. Bulletin 51, describing the details of construction of Reading "Everedy" electric hoists. Catalogue 53, descriptive of Reading chain hoists and chain blocks. Price lists and other information are included for the various styles.

SOCKET WRENCHES. Husky Wrench Co., Milwaukee, Wis. Chart showing application of socket wrenches for all bolts and nuts of the U. S., S. A. E. and new American standard. Copies will be furnished to manufacturers, designers, jobbers, and mechanics to simplify the selection of proper sockets for any bolt or nut.

MILLING MACHINES. Ingersoll Milling Machine Co., Rockford, Ill. Circular illustrating a number of representative milling machines built by this company, including heavy duplex open-side milling machine, open-side keywaying machine, special keyway milling machine, and inclined rail milling machine for locomotive rods.

TRAMRAILS. Cleveland Electric Tramrail Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio. Circular entitled "Are You Flagging the Twentieth Century at Every Cross-road?" illustrating the application of Cleveland tramrail systems for moving various classes of materials and reducing the idle time of machines.

GRINDING MACHINES. Blanchard Machine Co., 64 State St., Cambridge, Mass. Catalogue of the Blanchard automatic surface grinder No. 16-A for quantity production of the smaller pieces. In addition to the description and specifications of the machine, the catalogue includes many large illustrations of typical work, with production data.

WORM-GEARS. Fawcus Machine Co., Pittsburg, Pa. Bulletin E, descriptive of Fawcus worm-gears and drives. The catalogue contains information on the construction and application of these drives, as well as data for engineering departments, including tables of horsepower and ratios for worm-gear drives, dimension, and complete data on Fawcus worm hobs.

HEAT-TREATING FURNACES. W. S. Rockwell Co., 50 Church St., New York City. Bulletin 285, illustrating modern electric and fuel furnaces of the car and car-and-roll type for the heat-treatment of metal. A technical description of different forms of these furnaces, with an outline of the field of usefulness and limitations of the different designs, is included.

ELECTRIC EQUIPMENT. General Electric Co., Schenectady, N. Y. Circulars GEA-822 and GEA-827, illustrating and describing, respectively, the application of ball bearings in G.E. alternating- and direct-current general-purpose motors; and capacitors for power-factor correction. Circular GEA-849, containing instructions for ordering magnet frames for railway and industrial haulage motors.

PORTABLE ELECTRIC GRINDERS. Wisconsin Electric Co., Racine, Wis. Booklet entitled "1/10,000 of an Inch," containing an interesting treatise on the principles of interchangeable manufacture, dealing with the origin and development of this method; different kinds of fits; tolerances and limits; and the use of standard gages. A table giving allowances and tolerances for standard fits is included.

ALLOY STEELS. International Nickel Co., Inc., 67 Wall St., New York City. Pamphlet No. 11 of a series on nickel steel data and applications, containing notes on machining alloy steel. Pamphlet entitled "Alloy Cast Iron Meets High-duty Requirements," containing a description of the improved physical properties obtained by the addition of nickel to cast iron. Chart containing instructions for adding nickel to cast iron.

TRANSMISSION MACHINERY. Foote Bros. Gear & Machine Co., 232-242 N. Curtis St., Chicago, Ill. Catalogue 68, on Plamondon friction clutches and transmission machinery. This is a general catalogue, covering 191 pages, 5½ by 7¾ inches. It contains complete data, in tabulated form, of the Plamondon line of transmission machinery, including baseplates, bearings, belt tighteners, clutches, couplings, gears, hangers, pillow blocks, pulleys, etc.

BELT DRIVES. Chas. A. Schieren Co., 73 Ferry St., New York City. Pamphlets entitled "Factors in Determining Proper Center Distances for Leather Belt Drives," by Roy C. Moore, and "Fixed and Flexible Idlers on Leather Belt Drives," by the same author. These pamphlets contain technical information on the subject of belt drives, illustrated by both halftones and line engravings, and should be of interest to all those who have to do with the design or installation of this type of equipment.